

ASSESSMENT OF TERRESTRIAL ECOLOGY EFFECTS

NZ Transport Agency Waka Kotahi

Mill Road Stage 1

AUGUST 2026

NZ TRANSPORT AGENCY WAKA KOTAHI

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QUALITY REVIEW AND APPROVAL RECORD

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GLOSSARY

Specific terms	
ACO	Artificial Cover Objects
AEE	Assessment of Environmental Effects Report
AMP	Avifauna Management Plan
AUP(OP)	Auckland Unitary Plan (Operative in Part)
BCM	Biodiversity Compensation Model
DBH	Diameter at Breast Height (of trees)
DOC	Department of Conservation
EcIA	Ecological Impact Assessment
EcIA	Ecological Impacts Assessment
ED	Ecological District
eDNA	Environmental DNA
EIANZ	Environmental Institute of Australia and New Zealand
FTAA	Fast-track Approvals Act 2024
HREP	Habitat Restoration and Enhancement Plan
LMP	Lizard Management Plan
MfE	Ministry for the Environment
NPS-IB	National Policy Statement for Indigenous Biodiversity
NZTA	New Zealand Transport Agency Waka Kotahi
NZTCS	New Zealand Threat Classification System
OGTMP	Old Growth Tree Management Plan
RMA	Resource Management Act 1991
SEA	Significant Ecological Area
TAR	Threatened or At-Risk
TMP	Terrestrial Management Plan
VCP	Vegetation Clearance Protocol
WAA	Wildlife Act Authority
ZOI	Zone of Influence
General terms	
Basal area	Cross-sectional area of trees at Diameter Breast Height (DBH)
Biodiversity	The variety of life on Earth at all its levels, from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life
Ecology	The study of the relationships between living organisms, including humans, and their physical environment.
Effects management hierarchy - as per the NZTA EcIA Guidelines (2023)	These are the steps (approaches) applied sequentially that seeks to avoid, minimise and remedy the impacts of development on biodiversity. Only after these 'mitigation' steps have been applied and an adverse effect remains (residual effect) should biodiversity offsetting or compensation be considered.
Effects management hierarchy- as per the NPS-IB (2023)	A cascading approach to managing adverse effects on indigenous biodiversity, where avoidance is the top priority. If adverse effects cannot be avoided, they are then minimised, remedied, offset, or compensated, with compensation being the last resort.
Habitat clearance	Earthworks and/or vegetation clearance

Net gain - as per the NPS-IB (2023)	Demonstrated by a like-for-like quantitative loss/gain calculation of type, amount and condition of indigenous biodiversity, and is achieved when indigenous biodiversity values at the offset site are equivalent to exceed those lost at the impact site
Net positive	When the biodiversity benefits generated through compensation are expected to outweigh the residual adverse effects on indigenous biodiversity values, in accordance with the NPS-IB compensation principle that benefits must demonstrably exceed impacts
Mitigation	As per the NZTA EcIA Guidelines (2023), this includes: avoid, minimise, and remedy effects of ecological features
Significant Trees	Trees categorised as: Mature: Generally DBH of up to 50-80 cm; Large: Generally DBH of up to 80-130 cm; or Old-growth: At full expected DBH or more >130cm DBH
Zone of Influence	Area occupied by ecosystem, habitats and species that are adjacent to and may go beyond the boundary of the Project Footprint, that may be affected by the biophysical changes caused by the proposed Project and associated activities.
Site description	
Designation	Designation 6786
Project	Mill Road Stage 1 Project
Project Footprint	All land, including aquatic features, within the design footprint of the proposed road and associated infrastructure (e.g. stormwater), extending to the outer limits of planned earthworks

EXECUTIVE SUMMARY

This report assesses the terrestrial ecological effects of the Mill Road Stage 1 Project ('Project'). The assessment addresses terrestrial vegetation and habitats, Significant Ecological Areas, Significant Trees, threatened and at-risk terrestrial flora, bats, avifauna, herpetofauna, terrestrial invertebrates, pest animals and pest plants. The Project area is largely modified but contains important remnant indigenous forest values associated with Cheesman's Bush, the adjoining 134 Mill Road WF9 forest, Puhinui Gully, and the edge of Everglade Park / Kingsclere Place Reserve. The highest ecological values are associated with WF9 taraire, tawa, podocarp forest, VS5 broadleaved scrub / forest, mature and old-growth Significant Trees, king fern, copper skink, potential habitat for other native lizards, native forest bird habitat, and forest-floor invertebrate habitat.

The Project design has been refined to reduce ecological effects where practicable. Key refinements include changes to the Puhinui Gully bridge alignment and span to reduce effects on old-growth WF9 forest and Significant Trees, refinements to the Cheesman's Bush bridge width and construction method to reduce vegetation clearance and gully access, and changes to stormwater infrastructure to reduce direct effects on higher value vegetation. These measures reduce the severity of effects, but do not avoid all adverse effects. The Project will result in the direct loss of 0.924 ha of in-scope native-dominated vegetation or exotic forest with native understorey, permanent modification of 0.1245 ha of WF9 forest and 0.0161 ha of VS5 vegetation associated with bridge vegetation maintenance zones, and the loss of 0.267 ha of non-native vegetation that provides habitat for copper skink.

After avoidance, minimisation and remediation measures are applied, the main residual adverse effects are the loss and modification of WF9 taraire, tawa, podocarp forest, VS5 broadleaved scrub / forest, Significant Trees, confirmed and potential native lizard habitat, and potential effects on king fern. Residual effects on WF9 forest are assessed as a high level of ecological effect, residual effects on VS5 as moderate, residual effects on Significant Trees as very high, and residual effects on lizard habitat as high or moderate depending on habitat type. Residual effects on bats are assessed as negligible, reflecting the absence of recent bat detections and proposed pre-works survey and vegetation removal protocols if required. Residual effects on avifauna are generally assessed as low or very low with nesting bird protocols to avoid disturbance or impacts on nests in place.

The residual effects management package comprises approximately 20 ha of native restoration planting, including approximately 15.54 ha intended to establish vegetation with the long-term structure and composition of WF9 forest, [redacted] 1.05 ha of restoration and enhancement associated with the existing WF9 fragment at 134 Mill Road, and enhancement planting, pest plant control, pest animal control and monitoring within Cheesman's Bush, Puhinui Gully and 134 Mill Road. A further 4.15 ha of wetland and riparian planting, largely contiguous with the proposed WF9 restoration areas, is also proposed but has not been included in the Biodiversity Compensation Model. In total, 27.66 ha is proposed to be planted, restored, and/or enhanced.

The proposed package has been assessed using a Biodiversity Compensation Model and the model has been applied conservatively. It assumes total loss for directly affected and permanently modified vegetation, applies elevated risk and uncertainty multipliers, reduces compensation gains through moderate confidence factors, assigns low 10-year value scores to restoration planting, and excludes several expected ecological benefits. Even with this conservative approach, the model indicates that the package provides a 36.6% positive benefit to the affected terrestrial ecosystems.

Overall, the Project will result in unavoidable adverse effects on terrestrial ecological values, including mature WF9 forest and Significant Trees that cannot be replaced in the short or medium term. The

proposed effects management package is ecologically appropriate and proportionate to those residual effects. It addresses the affected values through indigenous forest restoration, habitat enhancement, lizard habitat replacement, pest plant and pest animal control, enhancement of retained forest remnants, and outcome monitoring. On that basis, the package is considered sufficient to manage the residual terrestrial ecological effects of the Project and deliver a positive modelled outcome for the affected terrestrial ecosystems.

1 INTRODUCTION

This report assesses the potential terrestrial ecological effects of the Mill Road Stage 1 Project (the 'Project').

The assessment has been prepared to inform the statutory approvals required for the Project, including approvals sought under the Fast-track Approvals Act 2024. It forms part of a suite of specialist reports that collectively support the applications for statutory approvals.

The assessment has been prepared by Andrew Blayney, and their qualifications and experience are set out in APPENDIX A. A separate freshwater EcIA has also been prepared as part of the substantive application.

1.1 Purpose and scope of this report

The scope of this assessment includes terrestrial vegetation and habitats, Significant Ecological Areas (SEAs), individual Significant Trees, threatened and at-risk terrestrial flora, bats, avifauna, herpetofauna, terrestrial invertebrates, pest animals and pest plants. Freshwater and wetland values are addressed only where they are relevant to terrestrial vegetation or terrestrial fauna habitat.

This assessment describes and assesses:

- the existing terrestrial ecological values within the Project footprint and wider zone of influence;
- the potential construction and operational effects of the Project on those values;
- the measures proposed to avoid, minimise and remedy adverse effects on terrestrial ecological values;
- the residual effects that remain after those measures are applied, including the need for biodiversity offsetting or ecological compensation; and
- the management requirements for native fauna and their habitats, including matters relevant to any Wildlife Act Approval.

Our assessment of effects focuses on vegetation within SEAs, riparian margins[1], and open space zoned land. For ease of reference, I refer to the vegetation within these areas as "in scope vegetation". This focus has been adopted because I understand indigenous vegetation removal is permitted, or otherwise authorised, within residential and business zoned land and within NZTA's existing designations (unless it is within an SEA or riparian margin).

This report should be read alongside the Substantive Application Report (SAR) which contains further details on the context of the Project. The SAR also contains a description of works to be authorised and the typical construction methodologies that will be used to implement this work. As such, they are not repeated here. Where a description of an activity is necessary to understand the Project's potential effects, it has been included in this report for clarity.

[1] We defined riparian margins as areas within 10m of the bank of a permanent or intermittent watercourse within the Project Area.

2 METHODS

2.1 Information sources

The desktop review considered Auckland Council GeoMaps, Auckland Unitary Plan Significant Ecological Area mapping, Auckland Council ecosystem extent data, Department of Conservation BioWeb records, New Zealand Threat Classification System publications, ecological regions and districts information, Singers and Rogers terrestrial ecosystem classifications (Singers & Rogers, 2014), Auckland indigenous terrestrial and wetland ecosystem mapping, New Zealand National Vegetation Survey information, Auckland War Memorial Museum records, iNaturalist records, eBird records, aerial imagery, Google Street View, Retrolens, and previous ecological assessments for the Mill Road corridor.

Previous ecological information reviewed included the Mill Road Corridor Study Assessment of Ecological Effects (Kessels & Associates Ltd, 2008), the Mill Road Corridor Notice of Requirement Assessment of Ecological Effects (Boffa Miskell Ltd, 2014), the Mill Road NZUP Summary Report: Ecological Factual Report (New Zealand Transport Agency, 2021), and earlier terrestrial habitat and SEA ecological assessment information for the corridor.

The desktop review was used to identify known and potential terrestrial ecological features, previous survey records, mapped SEAs, threatened ecosystems, historical flora records, fauna records, and areas requiring field verification. The main information sources used for this assessment are summarised in Table 2-1.

Table 2-1: Information sources used for the terrestrial ecology assessment

Information source	Primary relevance
Auckland Council GeoMaps, AUP overlays and ecosystem extent data	SEA extent, vegetation context, ecosystem type, regional and local extent comparisons
DOC BioWeb, threat classification series, iNaturalist and eBird	Records for bats, birds, lizards, threatened flora and notable invertebrates
Previous Mill Road ecological assessments	Historical baseline, previous species records, vegetation mapping and earlier survey findings
Aerial imagery, Google Street View and Retrolens	Vegetation history, habitat pattern, land-use change and access constraints

2.2 Field investigations

Site investigations were undertaken by AECOM ecologists between December 2024 and June 2025 to characterise terrestrial ecological values and refine mapping from previous assessments.

The survey programme included terrestrial habitat mapping, quantitative vegetation plots, threatened flora survey, individual tree assessment inputs from the arboricultural assessment, bioacoustic bat survey, potential bat roost assessment, five-minute bird counts, lizard surveys using ground and tree artificial cover objects, nocturnal spotlighting, manual and incidental searches, eDNA inputs relevant to lizards, incidental invertebrate observations, and observations of pest animal and pest plant pressure.

Vegetation survey effort focused on, but was not restricted to, Puhinui Gully, Cheesman's Bush, and Everglade Park / Kingsclere Place Reserve. These are the terrestrial ecological features most directly affected by the Project. The surveys were used to describe vegetation composition, structure, canopy maturity, regeneration, pest plant pressure, habitat condition, threatened and at-risk flora, and fauna habitat suitability.

I visually surveyed the site on 22 and 23 June 2026 to ground truth the existing data and update geospatial mapping where required. Like the AECOM surveys I focused time and detailed investigation on site on the areas of greatest sensitivity. However, I visually assessed the full proposed alignment extent.

2.3 Terrestrial vegetation survey methods

Terrestrial habitats along the Project corridor were mapped by refining previous Mill Road (New Zealand Transport Agency, 2021) habitat mapping using satellite imagery, aerial photography and site walkovers. vegetation was classified using Singers and Rogers (2014) ecosystem types, with exotic-dominated vegetation described using the Auckland ecosystem classification approach. The field investigations were treated as the primary source for spatial accuracy where they refined earlier desktop mapping.

Quantitative vegetation plot surveys were undertaken between February and May 2025 within Puhinui Gully and Cheesman's Bush. The surveys used an adapted RECCE (Hurst et al., 2022) method. A total of 25 plots were established: 11 plots in Puhinui Gully and 14 plots in Cheesman's Bush. Plot allocation used a stratified random approach based on a 200 m by 200 m grid, with plot locations adjusted where required for safety, access and replication requirements. Plot replication by vegetation or habitat type is summarised in Table 2-2.

Table 2-2: Vegetation plot replication by vegetation or habitat type

Vegetation or habitat type	Plot replication
Taraire, tawa, podocarp forest (WF9)	12 plots in Cheesman's Bush and 5 plots in Puhinui Gully
Broadleaved species scrub / forest (VS5)	2 plots in Cheesman's Bush and 6 plots in Puhinui Gully

The following vegetation survey method was employed:

1. A wooden stake was installed at the location of the monitoring station as determined using the GPS function of mobile phone devices (usually + / - 5 m). Wooden stakes were established at each of the four corners.
2. A 10 m x 10 m square was laid out positioned square to magnetic north (using a compass) with the stake at the centre of the square.
3. Four 2 m x 2 m squares were laid out in each corner of the 10 m x 10 m plot and assigned a label denoting the location of the plot relative to the square, i.e., N, E, S, W.
4. One geo-referenced photo was taken from head height from each corner of the 10 m x 10 m plot towards the centre stake to illustrate the vegetation composition of the 10 m x 10 m plot; and

Within each plot a RECCE vegetation assessment was undertaken to quantify the following for native and exotic species. This comprised an assessment of the following:

- Tree species richness, composition, abundance and DBH (diameter at breast height) across the entire 10 m x 10 m plot (100 m2). Trees were defined as woody stemmed vegetation > 2.5 cm DBH.
- Sapling richness, composition and abundance across the 10 m x 10 m plot (100 m2). Saplings were defined as woody stemmed vegetation > 135 cm high with a DBH < 2.5 cm.

- Seedling species richness, composition and abundance within four 2 x 2 m subplots (totalling 16 m2). Seedlings were defined as woody stemmed vegetation > 15 cm - < 135 cm high and were further categorised as small seedlings (15 cm – 30 cm high) and large seedlings (30 cm – 135 cm high).
- Percentage coverage of groundcover was recorded for rock, bare earth, leaf litter, live and dead wood, vegetation and moss. Percent cover of each species under the vegetation category were also recorded.

2.3.1 Threatened flora

A targeted survey for threatened flora was undertaken on 19 June 2025 within Cheesman's Bush, focused on habitat suitable for specific focus on locating the nationally 'At Risk – Declining' (de Lange et al., 2024) king fern (*Ptisana salicina*). Survey effort was directed to suitable microclimates conditions within the forested area such as moist, shaded gully habitat, stream banks, damp forest slopes suitable for this species as well as locations where king fern had previously been recorded. Surveyors walked suitable habitat systematically and visually searched for king fern fronds and rhizomes.

2.3.2 Individual trees

An Arboricultural Assessment has been undertaken by an arborist from Peers Brown Miller Ltd and is appended to this report as APPENDIX B.

2.4 Terrestrial fauna survey methods

2.4.1 Bats

Bat surveys used passive acoustic monitoring to detect long-tailed bats and assess activity, if present. Wildlife Acoustics Song Meter SM4BAT-FS units were deployed in locations selected to represent forest edges, open clearings, riparian zones, track margins, stream corridors and other potential movement routes. Units were programmed to record from 30 minutes before sunset to 30 minutes after sunrise. Surveys were undertaken from 16 December 2024 to 3 January 2025, 3 January to 3 February 2025, and 10 April to 2 May 2025.

Each monitoring deployment operated for at least 14 consecutive nights at each location to account for nightly variability in bat activity. Where practical, deployment periods were scheduled to avoid extended periods of heavy rain, strong wind, or other adverse weather conditions that can reduce bat activity and interfere with acoustic detection.

Recordings were processed using Kaleidoscope Pro (Wildlife Acoustics Inc.) and manually checked by a suitably competent bat ecologist. Trees and vegetation were also assessed for potential bat roost features.

Features that indicate roost potential include:

- Cavities
- Hollows
- Knot holes
- Cracks
- Flaking and peeling of bark
- Epiphytes

- Broken or dead branches or trunk

2.4.2 Avifauna

Avifauna surveys included five-minute bird (5MBC) counts undertaken in conjunction with the RECCE vegetation surveys (Section 2.3) in Cheesman's Bush and Puhinui Gully, together with incidental observations during site investigations. Bird count observers recorded birds within hearing distance over a five-minute period. Vegetation was also assessed for its potential to support nesting birds.

2.4.3 Herpetofauna

Lizard surveys were undertaken within Cheesman's Bush and Puhinui Gully within and adjacent to the Project footprint using passive and active survey methods, consistent with DOC best practice guidance, including the Lizard conservation toolkit (Anderson et al., 2012) and the DOC Inventory and Monitoring Toolbox: Herpetofauna (Department of Conservation, 2012). The survey methods were selected to improve the likelihood of detecting both diurnal ground-dwelling skinks and nocturnal arboreal geckos.

Sixty ground artificial cover objects (ACOs) and 40 tree-mounted ACOs were deployed through the SEA habitat at Cheesman's Bush and the Puhinui Gully, targeting forest edges, coarse woody debris and other suitable skink microhabitats, as well as mature native trees suitable for geckos. Ground ACOs comprised Onduline sheets approximately 400 mm by 400 mm, placed directly on the ground in suitable microhabitats such as forest edges, clearings and areas of coarse woody debris. Tree-mounted ACOs comprised Onduline sheets approximately 300 mm by 300 mm, secured to tree trunks 1 to 2 m above ground and generally placed on north-facing or sun-exposed aspects to improve thermal conditions. ACO locations are shown in APPENDIX D.

The ACOs were deployed between 16 and 20 December 2024, spaced at approximately 10 to 20 m intervals, and left undisturbed for approximately three months before survey checks to allow for colonisation. ACOs were inspected during warm, dry and calm conditions on 20 March 2025 and again on 14 April 2025, when they were retrieved. Each ACO was carefully lifted and checked for lizards and other herpetofauna.

Targeted nocturnal spotlighting surveys were undertaken between 14 and 16 January 2025 to detect arboreal geckos. Surveys were completed during calm, dry and warm nights, typically above 12°C, between dusk and midnight to coincide with peak gecko activity. Transects were walked through suitable habitat, focusing on shrublands, forest margins and canopy structures. Observers used high-powered LED headlamps and hand-held spotlights to systematically search foliage, trunks and branches. The survey was limited for arboreal species in taller trees because geckos in the upper canopy could not be reliably observed from the ground.

Manual searches and incidental observations were also undertaken opportunistically during the fieldwork period. These searches included careful inspection of natural cover objects such as logs, rocks and vegetation where suitable lizard habitat was present. Observations made outside formal survey sessions were recorded as incidental records, including species identity where possible, habitat features, location and environmental conditions. Incidental observations were recorded both within and outside the SEAs to inform the broader understanding of lizard distribution across the Project footprint.

Environmental DNA samples collected from selected stream sites within and adjacent to the Project footprint were also considered, as these samples could detect the potential presence of native lizard species associated with riparian habitats.

2.4.4 Invertebrates

Invertebrate observations were recorded as part of the incidental and manual searches for lizards, as well as during the ACO inspections. Searches specifically targeting invertebrates were not undertaken.

2.5 GIS identification of vegetation in scope of the assessment

Boffa Miskell GIS specialist Laurissa Jackson carried out the GIS assessment to assist with the analysis of in scope vegetation present and likely to be impacted by the Project.

The geospatial quantification of areas of vegetation in and out of scope of this assessment followed the decision tree in Figure 2-1.

With ArcGIS we used the identity tool to identify the intersecting vegetation cover data with the Auckland Unitary Plan zones (to identify Open Space zones), SEAs, existing NZTA designations, riparian margins, the designation extent.

This process produced a data set of areas with an additional five fields:

- In scope – yes or no;
- In an existing NZTA designation – yes or no;
- In a riparian margin – yes or no;
- In the open space zone – yes or no; and
- In the footprint of the designation extent – yes or no.

With this data set we were able to identify the total amount of vegetation within the Proposed Designation that was in scope of the assessment and the extent of that vegetation that is likely to be impacted by the Project.

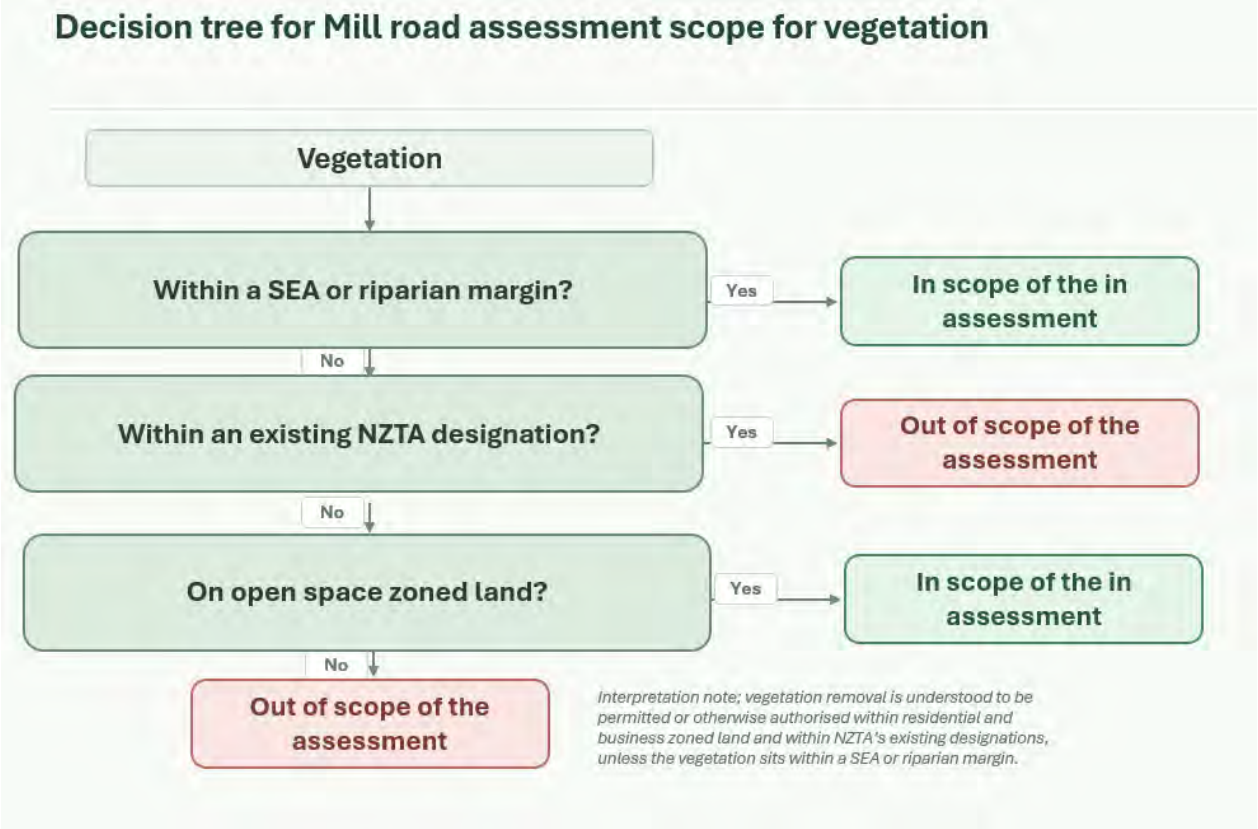


Figure 2-1: Decision tree for terrestrial vegetation in and out of scope of the assessment.

2.6 Assessment of ecological value and effects

Ecological values and effects have been assessed using the EIANZ ecological impact assessment guidance (Roper-Lindsay et al., 2018). Ecological value has been assessed by considering representativeness, rarity and distinctiveness, diversity and pattern, and ecological context. The magnitude of effect has been assessed by considering the scale, duration, intensity, reversibility and ecological consequence of the Project's impact on each value. Full details of the method are provided in APPENDIX C.

The assessment applies the effects management hierarchy. Effects that can be avoided or minimised through design and construction methods are identified first. Residual effects are then considered in terms of the need for remediation, offsetting, or compensation.

3 BASELINE ENVIRONMENT

3.1 Ecological context

3.1.1 Land use overview

The majority of habitats within and adjacent to the Project footprint are modified and are dominated by residential, rural, rural-residential, open space, roading and utility land uses. Indigenous forest fragments remain within and adjacent to the Project footprint, but these are now isolated remnants within a heavily modified landscape.

The Urban Section of the Project (which includes widening of the existing Redoubt Road) is predominantly urban residential, with a significant area associated with Tōtara Park and Open Space Recreation zoned

land. This area includes grazed land, conservation areas, planted riparian margins, recreational areas and existing road infrastructure.

The Rural Section of the Project (which includes widening of the existing Mill Road) is more rural in character. It traverses land zoned rural or mixed rural, with land west of Mill Road identified for future urban development. Several SEA forest fragments are present within and adjacent to the Project footprint, including Cheesman's Bush, Puhinui Gully, and Everglade Park / Kingsclere Place Reserve. These remnants form the main terrestrial ecological features relevant to this assessment.

3.1.2 Ecological districts

The Project is located within the Manukau and Hunua Ecological Districts. The Manukau Ecological District includes the lower-lying parts of the Project, including the Murphy's Road area and the Mill Road section between Ranfurly Road and the Alfriston Road junction. The Manukau Ecological District is a lowland landscape of flats and rolling hill country that was formerly almost entirely forested. The original forest type included the southern extent of northern North Island lowland forest with abundant taraire and pūriri (McEwen, 1987), which broadly corresponds with warm forest ecosystem types in the Singers and Rogers classification, particularly WF7 pūriri forest and WF9 taraire, tawa, podocarp forest.

The district has been extensively modified by clearance, farming, drainage and urban development. Only 6% of indigenous vegetation remains, and remnant forest is generally restricted to hillslopes, gullies, stream margins and land that has been less suitable for farming or development. Remaining forest includes examples of pūriri forest (WF7), taraire, tawa, podocarp forest (WF9), and kahikatea-dominant forest on wetter alluvial or gully-bottom sites, likely corresponding with WF8 kahikatea, pukatea forest or MF4 kahikatea forest depending on local landform and hydrology (Singers et al., 2017).

The Hunua Ecological District includes the Redoubt Road and Mill Road parts of the Project. It is characterised by lowland hilly topography, with a higher proportion of 36% remaining indigenous forest than the Manukau Ecological District (McEwen, 1987). The remaining indigenous forest is predominantly kauri, podocarp, broadleaved beech forest and tawa, kohekohe, rewarewa, hīnau, podocarp forest. In the Singers and Rogers classification these descriptions broadly correspond with WF12 kauri, podocarp, broadleaved, beech forest and WF13 tawa, kohekohe, rewarewa, hīnau, podocarp forest. WF9 taraire, tawa, podocarp forest is also present in warmer lowland settings (Singers et al., 2017). The Project lies within the more modified western part of this landscape, where indigenous forest is fragmented and occurs mainly as remnants, riparian corridors, planted areas and regeneration.

While indigenous forest remnants within the Western parts of Hunua ED are small and fragmented, they represent part of the remaining lowland indigenous forest resource in a landscape where extensive clearance has already occurred. Within the designation extent, the ecological value of Cheesman's Bush and Puhinui Gully is therefore not simply a function of their size. Their value also relates to their maturity, ecosystem type, remaining structural complexity, threatened or at-risk species, and role as refuges and stepping-stone habitat in a depleted landscape.

For this assessment, the main remnant forest type within the designation extent is treated as WF9 taraire, tawa, podocarp forest, with VS5 broadleaved species scrub / forest used for regenerating indigenous scrub and secondary broadleaved forest areas.

3.2 Terrestrial vegetation

3.2.1 Significant Ecological Areas

Desktop review identified SEAs within and near the Project footprint. The SEAs most relevant to this assessment are those directly affected or potentially affected by the Project. These SEAs are detailed within Table 3-1. SEAs near the proposed designation but not impacted by the Project are detailed within APPENDIX G.

Table 3-1 Significant Ecological Areas (SEAs) impacted or potentially impacted by Project activities

SEA ID and name	Distance from Project (km)	Location in relation to the Project.	Size and SEA criteria met
SEA_T_4570 Watercare Bush. Hereafter referred to as Puhinui Gully	0	Directly impacted. Bridge to go over Puhinui Stream within the SEA. Stream realignments within gully. Stormwater device and related outfall to flow into the SEA on the northwestern side.	8.6 ha Meets SEA criteria: • 3a Habitat diversity: WF9, VS5 • 4c Migration pathway
SEA_T_9102 Cheesman's Bush	0	Directly impacted. 50 m bridge to be built over the stream gully.	4.3 ha Meets SEA criteria: • 1a Representative of 10% natural extent within Eco District: WF9 • 2a Threatened ecosystem: WF9; 2b Threatened species: kaka (Nestor meridionalis septentrionalis), king fern (Ptisana salicina) • 4c Migration pathway
SEA_T_538a Everglade Park & Kingsclere Place Reserve	0	Directly impacted. Stormwater outfall (RG MM03) to be constructed on the western edge of the SEA.	1.3 ha Meets SEA criteria: • 1a Representative of 10% natural extent within Eco District: WF7 • *2a Threatened ecosystem*: WF7 Puriri forest (1.17 ha) • *4c Migration pathway*: WF9 Taraire, tawa, podocarp forest
SEA_T_538c Goodwood Drive reserve	0	Project Footprint at edge of SEA, but no vegetation clearance to occur. Upstream of SEA_T_538a.	0.9 ha. Meets SEA criteria: • 1a Representative of 10% natural extent within Eco District: WF7 • 2a Threatened ecosystem: WF7 Puriri forest • 4c Migration pathway
SEA_T_538	0.11	Downstream of SEA_T_538a, where new stormwater discharge occurs. No vegetation impacts.	0.5 ha Meets SEA criteria: • 1a Representative of 10% natural extent within Eco District: WF7 Puriri forest

SEA ID and name	Distance from Project (km)	Location in relation to the Project.	Size and SEA criteria met
			• *2a Threatened ecosystem*: WF7. Pūriri, tōtara forest, WF7.1
SEA_T_4571	0.17	Downstream of and to the southwest of Puhinui Gully (SEA_T_4570).	3.9 ha. Meets SEA criteria: • *2a Threatened ecosystem:* MF4 Kahikatea forest (1.2 ha) • 3a Habitat diversity: MF4, WF9, VS2 • *4b Buffer:* Buffers an SEA

3.2.2 Terrestrial habitat types

The terrestrial habitat within and adjacent to the proposed designation includes a mix of indigenous forest remnants, regenerating indigenous scrub / forest, planted indigenous vegetation, mixed native and exotic treeland, exotic treeland, exotic forest with native understorey, exotic scrub, exotic grassland, amenity planting, road corridor vegetation and open space grassed areas. The vegetation and landcover types relevant to this assessment are described in Table 3-2 and maps are provided in APPENDIX E. The highest value terrestrial vegetation types are WF9 taraire, tawa, podocarp forest and VS5 broadleaved species scrub / forest. Other identified vegetation communities have lower botanical value but are regarded as of ecological value where they provide habitat for indigenous fauna, particularly lizards and birds, or where they buffer SEA vegetation.

Note that vegetation types identified in Appendix E maps reflect land-use history, planting origin, canopy dominance and mapping convention, so that boundaries between types do not necessarily represent well defined ecological thresholds. For assessment purposes, the key distinction is between mature remnant indigenous forest, regenerating indigenous scrub / forest, planted or mixed native vegetation, exotic woody habitats that provide fauna habitat, and low-value grassland or developed land.

Table 3-2: Terrestrial vegetation and landcover types identified in the Project area

Vegetation / landcover type	Description and occurrence
WF9 Taraire, tawa, podocarp forest	Indigenous forest occurring at Cheesman's Bush, Puhinui Gully, Everglade Park / Kingsclere Place Reserve, and the gully at 134 Mill Road. Canopy and emergent species include taraire, tawa, pūriri, kahikatea, tōtara, pukatea, rimu, miro, rewarewa, kohekohe and associated broadleaved species. Structure varies from mature forest with large and old-growth trees to disturbed or edge-affected forest. It represents a regionally endangered ecosystem type and provides mature forest structure, habitat for threatened and at-risk flora, potential bat roost features, native bird habitat, [redacted] and forest-floor invertebrate habitat.
VS5 Broadleaved species scrub / forest	Regenerating indigenous scrub / forest, most notably at Puhinui Gully Scrub and in smaller areas around Cheesman's Bush. Species include māhoe, māpou, hangehange, kanono, kawakawa, nīkau, tarata, karaka, pūriri, kahikatea, taraire, tawa, rewarewa, tūrepo and tree ferns, with weed abundance varying by canopy condition and edge exposure. It is more modified than mature WF9 forest but provides native vegetation structure, buffering, bird habitat, lizard habitat and ecological connectivity.

Vegetation / landcover type	Description and occurrence
EF.1 Exotic forest with native understorey	Forest with an exotic canopy and a native-dominated or native-rich understorey. In the Project area this occurs mainly as pine-dominated forest adjacent to Puhinui Gully Scrub, where native broadleaved species and tree ferns are regenerating below the exotic canopy. Botanical representativeness is limited by the exotic canopy, but the native understorey and structural cover provide fauna habitat, buffering and a future native regeneration trajectory if managed.
TL.2 Mixed native and exotic treeland	Treeland with mixed native and exotic canopy cover. Native species may include pūriri, tōtara, karaka, māhoe, cabbage tree and other broadleaved species, with exotic trees or shelterbelt species also present. It can provide stepping-stone habitat, lizard habitat, bird foraging habitat and local buffering, but lacks the structure and indigenous dominance of WF9 or VS5.
TL.3 Exotic dominated treeland	Treeland dominated by exotic trees, including shelterbelts, amenity trees, pine, eucalyptus, poplar, willow or other exotic canopy species, often with grass, rank grass, scrub or scattered native understorey beneath. Ecological value is primarily as fauna habitat, potential bat roost substrate where mature trees contain cavities or flaking bark, bird habitat, lizard cover and local landscape structure.
PL.1 Planted native vegetation less than 20 years old	Young indigenous planting, including riparian planting, stormwater planting, road margin planting, revegetation and restoration planting. Species are typically common early successional and restoration species such as mānuka, kānuka, māhoe, karamū, cabbage tree, harakeke, tī kōuka, māpou and other hardy native shrubs and trees. Young planting generally lacks mature forest structure but contributes to indigenous cover, riparian function, habitat connectivity and fauna habitat.
PL.2 Planted native vegetation greater than 20 years old	Older planted indigenous vegetation, including riparian or open space plantings with more developed canopy and shrub layers than PL.1. Species composition reflects planting palettes rather than natural site sorting, but structure is generally more developed than younger plantings. These areas can provide more valuable habitat, buffering and connectivity functions than young planting, although they remain planted and generally lack the complexity of remnant forest.
PL.3 Native and / or amenity planting	Native or mixed amenity planting associated with roads, reserves, gardens, open space and developed land. May include planted native shrubs and trees, ornamental native species, exotic amenity species, shelter planting and landscaping. It can provide bird foraging habitat, lizard habitat, amenity native cover and local connectivity, but is generally modified and readily replaceable.
ES Exotic scrub	Scrub dominated by exotic species such as gorse, blackberry, woolly nightshade, privet, pampas, ginger, tradescantia, Himalayan honeysuckle and other disturbance-tolerant weeds. Exotic scrub occurs on forest margins, unmanaged slopes, gullies and disturbed land. Dense exotic scrub can provide cover for lizards, birds and invertebrates and may buffer forest edges, but also can suppress indigenous regeneration and contributes to weed pressure.
EG Exotic grassland	Pasture, rank grassland, road verge grassland, open space grassland and unmanaged exotic grass areas, often dominated by kikuyu and other exotic pasture grasses. This is common throughout modified parts of the Project area, including rural land, open space, road margins and disturbed sites. Rank grassland and rough margins can provide copper skink habitat and possible pipit habitat, but otherwise have limited terrestrial ecological value.
Road corridor, hardstand and built surfaces	Existing road pavement, shoulders, accessways, driveways, hardstand, buildings and highly modified developed surfaces with little or no vegetation. Ecological relevance is limited to these land uses impacts such edge effects, stormwater discharge pathways, weed dispersal and fragmentation.
Open space, parkland and amenity grass	Managed grassed open space, lawns, recreational areas, grazed parkland and mown road margins, including parts of Totara Park and other reserve or roadside areas. These areas may provide foraging habitat for common birds and potential pipit habitat where grass height and disturbance conditions are suitable but are generally modified and replaceable.

3.3 Vegetation survey results

RECCE vegetation surveys were undertaken within two SEAs: SEA_T_4570 at Puhinui Gully and SEA_T_9102 at Cheesman's Bush. A site walkover was undertaken at SEA_T_538a, Everglade Park / Kingsclere Place Reserve, where Project effects are concentrated at the edge of the SEA. APPENDIX H provided the detailed results of the vegetation surveys.

A total of 77 plant species were recorded across the SEAs from vegetation plots and incidental observations during vegetation mapping. This included 47 native and seven exotic species within Cheesman's Bush, and 44 native and 15 exotic species within Puhinui Gully. Species richness across plots ranged from seven to 24 species per plot. The highest overall species diversity was recorded in VS5 habitat, reflecting the mix of native and exotic species in regenerating scrub. The highest native species diversity was recorded in WF9 habitat.

Cheesman's Bush WF9 plots were typically dominated by native species, with low exotic presence. Puhinui Gully VS5 plots had greater exotic species diversity, particularly where canopy cover was reduced. Overall, the vegetation surveys confirm a pattern of higher indigenous dominance and structural maturity in WF9 forest, with more weed incursion and variable condition in VS5 and edge habitats.

The vegetation surveys confirmed a clear distinction between the higher value indigenous forest and scrub habitats and the more modified vegetation, and landcover types present through the wider Project area. WF9 taraire, tawa, podocarp forest is the principal remnant indigenous forest type affected by the Project. The best examples occur within the cores of Cheesman's Bush and Puhinui Gully, which scored highly with respect to canopy stature, indigenous dominance, mature native trees, subcanopy development, epiphytes, lianas and forest-floor habitat.

Forest condition was more variable toward road margins, forest edges, canopy gaps and disturbed areas. These locations generally had greater weed pressure and reduced structural integrity, although they still formed part of the wider forest habitat and contributed to buffering, connectivity and fauna habitat. The surveys also confirmed that the WF9 remnants support the main mature forest features relevant to the assessment, including large native trees, potential bat roost features, native bird habitat, lizard habitat, forest-floor habitat and threatened or at-risk flora habitat.

VS5 broadleaved species scrub / forest was most prominent at Puhinui Gully Scrub, with smaller areas associated with Cheesman's Bush. This habitat was more structurally and compositionally variable than WF9 forest. Better condition areas supported native tree ferns and broadleaved species forming a developing indigenous canopy or subcanopy. Poorer condition areas, particularly around canopy gaps and exposed edges, supported a higher cover and diversity of exotic weed species. Despite this variability, VS5 provides important regenerating indigenous scrub / forest habitat and functions as a transition between mature forest, exotic scrub, grassland and developed margins.

The remaining vegetation and landcover types were generally more modified and of lower botanical value. Exotic forest with native understorey, mixed native and exotic treeland, exotic treeland, planted native vegetation, amenity planting, exotic scrub and rank grassland were recorded in and around the Project area. These habitats were not equivalent to remnant WF9 forest or regenerating VS5 scrub / forest, but they remain relevant where they provide fauna habitat, buffering, local connectivity, stepping-stone cover, potential bat roost substrate, lizard cover, bird foraging habitat or habitat for common terrestrial invertebrates.

The surveys also confirmed that edge effects are a key feature of the baseline. Weed pressure, canopy gaps, exotic scrub, road margins, developed edges, stormwater discharge areas and existing

fragmentation influence the current condition of the affected vegetation. These factors are important for interpreting the baseline because Project effects will occur in vegetation that is already subject to varying levels of modification, rather than in continuous intact forest.

3.3.1 Cheesman's Bush: SEA_T_9102

Cheesman's Bush is a remnant of taraire, tawa, podocarp forest (WF9), with a small area of broadleaved species scrub / forest (VS5) on the north-western side. Exotic scrub is present around parts of the SEA edge and around the VS5 area. Planted native vegetation links the SEA to a further WF9 forest patch on the neighbouring property at 134 Mill Road.

The southern half of Cheesman's Bush contains mature indigenous canopy trees, including taraire, pūriri and pukatea. Recorded tree sizes include pūriri up to approximately 163 cm DBH and multi-stem taraire up to approximately 130 cm DBH. Mature rewarewa are concentrated toward upper slopes. The south-eastern gully contains nīkau and ponga, with kohekohe, tōtara, rimu and pukatea locally present.

The understorey varies across the remnant. It is densest in the north-eastern part of the SEA where the vegetation transitions toward VS5, with māpou, hangehange, lancewood and kānuka forming a more layered subcanopy. Under mature taraire on lower slopes, the understorey is more sparse, likely reflecting shading and historical browsing pressure.

The forest edge includes species characteristic of edge conditions (rangiora, kānuka and mingimingi). Groundcover is dominated by ferns, including pānako / thread fern and huruhuru whenua / shining spleenwort. Epiphytes and vines contribute to forest structure, including kōwaowao / hound's tongue fern, fragrant fern and climbing rātā.

King fern (At Risk – Declining Nationally and regionally) (de Lange et al., 2024; Simpkins et al., 2025) was confirmed within the Project footprint in Cheesman's Bush during the targeted survey on 19 June 2025. One individual was recorded near the intermittent stream corridor. The plant was medium sized, with a crown approximately 1.5 to 2 m across and fronds up to approximately 1.5 m long. Its location in moist, shaded streamside habitat is consistent with the species' habitat requirements. Further individuals may occur further up the gully.

Carmine rātā (At Risk – Declining) and white rātā (Not Threatened nationally but At-Risk Declining Regionally) (de Lange et al., 2024; Simpkins et al., 2025) have been recorded historically or during previous survey work in the broader Cheesman's Bush / Puhinui Gully area. They were not found during the 2025 survey programme, but their presence is assumed unless further survey confirms otherwise. This report should use current national and regional threat classifications consistently in later sections.

Pest control has previously occurred in Cheesman's Bush, as indicated by bait stations observed at close spacing on the forest floor. The timing, continuity and responsibility for that pest control has not been confirmed.

3.3.2 Puhinui Gully: SEA_T_4570

SEA_T_4570 contains remnant WF9 forest, referred to here as Puhinui Gully Bush, which transitions into VS5 broadleaved scrub / forest, referred to here as Puhinui Gully Scrub. The canopy of Puhinui Gully Bush is dominated by mature taraire on steeper and drier terraces and by kahikatea on flatter, wetter hillslopes and gully bottoms.

Weed incursion is present, particularly along edges and beside Mill Road. Weed species include tradescantia and montbretia along stream margins, together with tree privet and monkey apple scattered through the vegetation and more concentrated near the roadside.

Puhinui Gully Scrub becomes more prominent to the east, where the gully is dominated by tree ferns and māhoe becomes a dominant subcanopy species as the habitat transitions from WF9 forest to VS5 scrub / forest. Weed species recorded in the VS5 habitat include gorse, blackberry, Himalayan honeysuckle, pines, Chinese privet, tree privet, pampas, woolly nightshade, tradescantia, creeping buttercup, kikuyu, lotus, black nightshade and hedge woundwort. Native species include kanono, hangehange, kawakawa, nīkau, tarata, rimu, karaka, pūriri, kahikatea, taraire, tawa, rewarewa, tūrepo and tree ferns.

Groundcover and epiphytic layers are dominated by native ferns and sedges where canopy cover is intact. Exotic herbs are more common in canopy gaps. This pattern is typical of a remnant subject to edge effects, weed pressure and variable canopy condition.

Within the WF9 portion of Puhinui Gully Bush, the tree age and size data confirm a structurally mature canopy. Old-growth trees recorded included tōtara and kahikatea, with DBH values exceeding 212 cm and 130 cm respectively. Additional large trees included miro, rimu, rewarewa and kahikatea, with further mature kahikatea recorded. These trees are important because they provide mature forest structure, canopy height, cavities, epiphyte support, coarse woody debris over time, seed sources and fauna habitat.

Carmine rātā and white rātā were detected during previous surveys in Puhinui Gully Bush but were not recorded during the 2025 surveys. They are assumed to remain present unless further survey confirms otherwise.

3.3.3 Everglade Park / Kingsclere Place Reserve: SEA_T_538a

SEA_T_538a contains indigenous forest at Everglade Park / Kingsclere Place Reserve. Site observations indicate a canopy dominated by pūriri, tōtara, karaka and pigeonwood, with māhoe and rewarewa also present. The understorey includes kawakawa, tree ferns and common ferns.

Typical WF9 species such as kohekohe, taraire, tītoki and nīkau were not observed during the survey, but may persist at low abundance in less accessible parts of the remnant. The part of the SEA affected by the Project is at the forest edge, where planted and disturbance-tolerant species such as karamū, wineberry, mānuka / kānuka, karo and cabbage tree were present. Weed species recorded included privet, woolly nightshade, ginger and tradescantia.

3.3.4 134 Mill Road WF9 forest outside the SEA overlay

A stand of WF9 (taraire, tawa, podocarp forest) not encompassed within the SEA overlay is present within a gully system at 134 Mill Road, is connected to the Cheesman's SEA (SEA_T_9102) and is of comparable type and value. Several large native trees are present, including a 173 cm DBH pūriri (*Vitex lucens*), along with pigeonwood (*Hedycarya arborea*), taraire (*Beilschmiedia tarairi*), māhoe (*Melicytus ramiflorus*), kahikatea (*Dacrycarpus dacrydioides*), and rimu (*Dacrydium cupressinum*). The gully also contains several intermittent streams, contributing to its ecological complexity and habitat value.

Compared to Cheesman's SEA, this site has a higher presence of pest plant species. While this vegetation would, based on the scope described in Section 1.1 & 2.5, be excluded from the scope of this report.

As such, while outside the defined assessment scope because vegetation removal in this area is a permitted activity, NZTA's instructions were to adopt a conservative approach and include this vegetation

in the assessment because it forms a contiguous extension of the Cheesman's Bush forest remnant and supports ecological values comparable to those within the mapped SEA.

3.4 Significant Trees

The term ‘Significant Trees’ is used in this report to describe mature, large or old-growth indigenous trees that provide ecological functions beyond ordinary vegetation cover. These functions include canopy structure, shade, cavities, hollows, fissures, flaking bark, epiphyte habitat, future coarse woody debris, seed and fruit resources, microclimate regulation, and roosting, nesting or refuge habitat for indigenous fauna.

An Arboricultural Assessment of individual Significant Trees within the potential impact areas of the SEAs has been undertaken by Peers Brown Miller Ltd and is appended to this report as APPENDIX B. This report should be referred to for the primary information on the values of individual trees.

This assessment considers Significant Trees in the context of their ecological values and function as part of the wider forest ecosystem.

Within Cheesman’s Bush, the forest includes podocarp-broadleaved canopy with canopy heights of approximately 20 to 28 m. The canopy includes large kahikatea, taraire, pūriri and kohekohe. The arboricultural information identifies Significant Trees within the proposed designation and / or maintenance area.

Within Puhinui Gully, Significant Trees include large and old-growth podocarps and associated hardwoods. The arboricultural information identifies an old-growth tōtara of approximately 212 cm DBH, a large kahikatea, and other large or mature native trees. The Arboricultural Assessment identifies which trees are to be retained, trimmed, topped, or fully removed.

3.5 Pest animals

Introduced mammalian predators and browsers are expected to be present across the Project area. These include possums, rats, mice, mustelids, cats and hedgehogs. These species affect indigenous biodiversity through predation of birds, lizards and invertebrates, nest predation, browsing of native vegetation, reduction in seedling recruitment, and competition or indirect effects on ecological processes.

Rodent calls were abundant during acoustic monitoring for bats (Section 3.6), which is consistent with a high level of rodent activity. Possums, rats, mice, ferrets and stoats are likely to be established in the Project area. There is no evidence of a continuous, comprehensive pest control programme across the relevant landscape. Pest animal pressure is therefore treated as an existing ecological stressor affecting forest condition, fauna abundance and likely restoration outcomes.

3.6 Bats

Pekapeka/Long tailed bat (*Chalinolobus tuberculatus*) threat status is Threatened – Nationally Critical both nationally and regionally within Auckland (O’Donnell et al., 2023; Woolly et al., 2024).

A desktop review identified one historical record of long-tailed bat activity within the proposed designation at 353 Redoubt Road in 2014. Other bat records occur in the wider landscape, including records from Clevedon, Drury Creek Island Recreation Reserve, the Hunua Ranges and Pukekohe. Known populations are present to the east in the Hunua Ranges and to the south near Pukekohe. There is some landscape connectivity between the Hunua Ranges and the Project area through SEAs, treelands and freshwater corridors, although the Project footprint is not known to support a resident bat population. Details of the

locations of surveys and their results found during the desktop investigations are provided in (APPENDIX I).

Three rounds of acoustic bat monitoring were undertaken for this assessment between December 2024 and May 2025. No bat calls were detected during the 2024–2025 survey programme (APPENDIX I). Earlier surveys in the Project area also generally recorded no bats, apart from the historical 2014 record.

Although no bats were detected during the recent survey programme, multiple trees and areas of vegetation with potential bat roost features were identified (Figure 3-1). These features included cracks, crevices, cavities, hollows, holes and flaking bark. They were particularly common in larger and older trees within Cheesman's Bush, Puhinui Gully and the 134 Mill Road gully.

On that basis, long-tailed bats are unlikely to be present regularly within the Project footprint, but occasional use in the future cannot be completely ruled out. The baseline value for bats is therefore driven by the presence of potential roost habitat in mature trees and the species' high conservation status.



Figure 3-1: Trees with bat roost features within the Project Footprint (AECOM 2025)

3.7 Avifauna

Native birds were recorded during five-minute bird counts in the SEAs and through incidental observations during fieldwork. Native bird diversity was generally restricted to common native species and was broadly consistent within and between the SEAs. APPENDIX J provides a full list of the species detected during 5MBC, incidental observations, and in desktop research.

Tūī and kererū are common and widespread but are ecologically important because they provide pollination and seed-dispersal functions for indigenous forest species. They are a relevant component of the value of the affected forest remnants. Kākā were observed twice during fieldwork, mainly flying over

Puhinui Gully. Kākā are unlikely to be resident in small remnants such as Cheesman's Bush or Puhinui Gully but may use them seasonally for food resources or as stepping-stone habitat.

Desktop records identify long-tailed cuckoo and kārearea / bush falcon within the wider area. These species are likely to be transient or occasional users rather than resident breeding species in the Project footprint. New Zealand pipit has been recorded at Auckland Botanic Gardens and may use open grassland habitats such as Totara Park Primary habitat for NZ pipits is open country / pasture. Their preferred nesting habitat is rank grassland. Exotic grassland within the proposed designation provides foraging and roosting habitat for NZ pipit. Under its current land use the proposed designation is unlikely to provide nesting habitat for NZ pipit as grassland is grazed or mowed and regularly disturbed by farming and maintenance activities.

3.8 Herpetofauna

Desktop records identify copper skink [redacted] A 2014 lizard survey recorded an unconfirmed gecko, considered likely to be forest gecko, near [redacted] A landowner report also identified [redacted]

Several vegetation types within the Project footprint provide potential lizard habitat. These include exotic scrub, unmanaged rank grassland, exotic treeland, native plantings and the SEAs. Ground-dwelling skinks may use areas with leaf litter, unmanaged grass, woody debris, rock, logs or dense vegetation. The SEAs also provide potential habitat for arboreal geckos, particularly where mature native trees, dense small-leaved vegetation and complex forest edges are present.

The 2024–2025 ACO surveys recorded only exotic plague skink (*Lampropholis delicata*) in the ACOs, scattered through Puhinui Gully and Cheesman's Bush. No lizards were observed during spotlighting. However, at least four copper skinks were observed during manual searches under a decaying fallen log in Cheesman's Bush. Copper skink (*Oligosoma aeneum*) was also detected in an eDNA sample taken from stream S04 in Totara Park. The location of ground and tree ACOs are mapped within APPENDIX D.

Species present or potentially present in the Proposed designation are as follows[2]:

- Copper skink (*Oligosoma aeneum*), *at-risk – declining;* habitat generalist that prefers dense and complex habitats. Persists in both urban and rural environments.
- Ornate skink (*Oligosoma ornatum*), *at-risk - declining*; cryptic species preferring damp thick leaf litter, rock piles and dense vegetation. Persists in the urban and rural environment. This species has not been confirmed in the wider landscape.
- Forest gecko (*Mokopirirakau granulatus*), *at-risk - declining*, and Pacific gecko (*Dactylocnemis pacificus*), *at-risk - relict*; all can inhabit forest, scrublands, and herb fields, rock piles, creviced rocky bluffs. Persists in rural and peri-urban environments.
- Elegant gecko (*Naultinus elegans*), *at-risk - declining*; inhabits forest, scrublands often co-habits with forest gecko.
- Plague skink (*Lampropholis delicata*) an invasive, non-native, species occupying most farmland, peri urban, and urban habitats.

[2] Threat statuses are aligned with Hitchmough et al. (2026) and habitat preferences follows that described within Van Winkel, Baling, & Hitchmough (2018).

For assessment purposes, the lizard assemblage is treated conservatively. Copper skink is confirmed present, and the other native lizard species are assumed to be potentially present where suitable habitat occurs. This is appropriate given the limits of detectability for lizards, the maturity and complexity of some habitat, and the previous local records.

3.9 Invertebrates

Targeted invertebrate surveys were not undertaken. Invertebrate observations were recorded incidentally during site walkovers, lizard searches and ACO inspections. Incidental observations included Auckland tree wētā, tunnelweb spiders, native bush cockroaches, leaf-veined slugs and introduced species such as leopard slug.

Desktop review identified the potential for notable invertebrates to occur in the Project footprint, including the At Risk – Declining rhytid snail *Amborhytida dunniae*, cave wētā *Pachyrhamma* species, and peripatus / velvet worms. Rhytid snails and peripatus are associated with damp, sheltered habitats with leaf litter, woody debris and stable microclimates. Cave wētā may occur in dark, moist, sheltered places such as hollow trees, cavities, rocks or similar refuges.

None of these potentially present invertebrates are listed as protected wildlife under Schedule 7 of the Wildlife Act (1953). They remain relevant ecologically because they contribute to the indigenous fauna values of mature and regenerating forest and can be affected by vegetation clearance, soil disturbance, drying of forest edges and removal of coarse woody debris.

For the remainder of this assessment, vegetation values and associated effects are treated as proxies for terrestrial invertebrate values and effects. This reflects the absence of targeted invertebrate survey data and that the invertebrate assemblages present are primarily habitat-mediated, with their value and vulnerability closely linked to vegetation type, structural complexity, litter and coarse woody debris, moisture, shading, and edge effects.

4 ECOLOGICAL VALUES ASSESSMENT

Ecological values have been assigned using the EIANZ ecological value attributes provided in APPENDIX C: representativeness, rarity/distinctiveness, diversity and pattern, and ecological context. This section separates vegetation and ecosystem value from fauna habitat value. This avoids inflating the botanical value of modified habitats solely because they may support indigenous fauna, while still recognising their fauna habitat function where relevant.

4.1 Terrestrial vegetation and ecosystem values

The assessment of ecological value of the vegetation types is provided in Table 4-1. Species of notable value were limited to king fern, carmine rata, and white rata which have a **High** ecological value due to their national or regional threat status of At-Risk Declining.

Significant trees are assessed separately within Table 4-1 to ensure their age, stature, and contribution to ecosystem and habitat services and resources within the Cheesman's and Puhinui Gully are adequately factored into the impact assessment. The later effects assessment will look primarily at the ecosystem effects, through which the loss of the features provided by the Significant Trees will be accounted for, rather than focus on individual trees. The assessment of impacts on individual trees is in scope of the Arboricultural Assessment (APPENDIX B).

Table 4-1: Terrestrial vegetation ecological values assessment.

Vegetation / ecosystem value group	Ecological value attribute	Score	Assessment
WF9 taraire, tawa, podocarp forest at Cheesman's Bush and Puhinui Gully	Representativeness	High	Remnant indigenous forest retaining key canopy, subcanopy and groundcover elements of WF9 taraire, tawa, podocarp forest. The forest is fragmented and edge affected, but still contains mature and old-growth native trees, indigenous dominance, some native regeneration and recognisable ecosystem structure.
	Rarity/distinctiveness	High	WF9 is a regionally threatened ecosystem type and is now substantially reduced in extent in the relevant ecological districts. The forest remnants include mature and old-growth native trees and support or are likely to support threatened or at-risk indigenous flora.
	Diversity and pattern	High	Vegetation has relatively high native species richness, mature canopy structure, subcanopy and groundcover layers, epiphytes, lianas and forest-floor habitat. Diversity and pattern are strongest in the less disturbed parts of the remnants and reduced near edges, gaps and weed-affected margins.
	Ecological context	High	These remnants provide indigenous forest refuge habitat in a highly modified landscape. They contribute to local ecological connectivity, support seed sources and regeneration, buffer stream and gully systems, and provide mature forest structure that is not readily replaceable.
	Overall score	Very High	
Regenerating indigenous scrub / forest VS5 broadleaved species scrub / forest at Puhinui Gully Scrub and smaller associated areas	Representativeness	Moderate	Regenerating indigenous scrub / forest with native broadleaved species, tree ferns and developing indigenous structure. The vegetation is modified, fragmented and affected by edge effects and weed incursion, but remains broadly representative of regenerating indigenous scrub / secondary forest.
	Rarity/distinctiveness	Moderate	The vegetation type itself is not as rare or distinctive as WF9 forest, but it forms part of the indigenous vegetation sequence around threatened lowland forest remnants and contributes to the remaining indigenous vegetation resource in a highly modified landscape.
	Diversity and pattern	Moderate	Native species are present and locally common, with developing canopy and subcanopy structure. However, diversity and pattern are reduced by weed presence, canopy gaps, edge effects and variable indigenous dominance.
	Ecological context	High	Provides buffering, transitional habitat and connectivity around remnant indigenous forest. It contributes to ecological resilience by supporting natural regeneration and reducing exposure of higher value forest edges where intact.
	Overall score	Moderate	
Significant Trees within WF9 (Cheesman's and Puhinui Gully /Puhinui Gully) and VS5 (Puhinui Gully Scrub)	Representativeness	High	individual trees (e.g., pūriri, tōtara, kahikatea, taraire) are characteristic of the original WF9 and VS5 ecosystem types. These Significant Trees display natural growth forms, large diameters (some >150–200 cm DBH), and structural attributes associated with old-growth forest. They also include a representative range of epiphytes and non-vascular species representative of mature forest.
	Rarity/distinctiveness	Moderate	The individual trees themselves are locally distinct for size and age, even though the species represented (taraire,

Vegetation / ecosystem value group	Ecological value attribute	Score	Assessment
			pūriri, tōtara, kahikatea) are not rare or threatened at the national level.
	Diversity and pattern	High	Large trees contribute to vertical stratification, microhabitat formation (e.g., cavities, epiphyte loads, shaded understorey), and overall structural complexity within otherwise fragmented habitats.
	Ecological context	High	Significant trees provide key ecological functions such as seed dispersal resources, long-term carbon storage, habitat for indigenous fauna (birds, lizards, invertebrates), and stepping-stone canopy resources that support connectivity across the wider landscape.
	Overall score	Very High	
Planted, mixed or modified woody vegetation PL.1, PL.2, PL.3, TL.2 and EF.1	Representativeness	Low	Vegetation is modified, planted, mixed native and exotic, or has an exotic canopy. Some areas contain indigenous species and developing native structure, but species assemblages and vegetation structure generally reflect planting, disturbance history or exotic canopy dominance rather than intact indigenous ecosystem expression.
	Rarity/distinctiveness	Low	The vegetation types are not rare ecosystem types and generally do not contain unusual vegetation assemblages. Any value associated with threatened or at-risk fauna habitat is assessed separately as fauna habitat value.
	Diversity and pattern	Low	Native species diversity and structure vary between sites. Older planted native vegetation and exotic forest with native understorey can provide some vertical structure and indigenous regeneration, while amenity and younger plantings are generally simpler and more uniform.
	Ecological context	Moderate	These areas can buffer higher value habitats, improve local connectivity, provide stepping-stone vegetation and contribute to the wider vegetated network. Context is stronger where these areas adjoin SEAs, riparian margins or other indigenous vegetation.
	Overall score	Low	
TL.3 exotic-dominated treeland, ES exotic scrub, EG exotic grassland, amenity grass, road corridor and built surfaces	Representativeness	Very low	Vegetation is exotic-dominated, highly modified, planted for amenity, maintained as grass, or absent. These areas do not represent indigenous terrestrial ecosystem types.
	Rarity/distinctiveness	Very low	The vegetation types are common in modified rural, urban and road corridor settings. They do not constitute rare ecosystem types and do not contain distinctive indigenous vegetation assemblages.
	Diversity and pattern	Very low	Vegetation is generally simple, exotic-dominated and structurally limited. Exotic scrub and treeland can provide structural complexity, but that structure is not an intrinsic indigenous vegetation value.
	Ecological context	Low	Ecological context is generally low, although some areas provide buffering, cover or stepping-stone vegetation near higher value habitats. Fauna habitat value is considered separately and should not be used to inflate intrinsic vegetation value.
	Overall score	Negligible	

4.2 Bats

Long-tailed bats have a **Very High** ecological value based on its national and regional threat status. No bats were detected during the 2024–2025 acoustic surveys, despite multiple survey rounds within the Project area. Historic records indicate occasional bat activity in the wider landscape, and mature trees within the Project area provide potential roost features. On that basis, the Project area is not considered to be a core bat roosting, commuting or foraging area, but potential bat use cannot be fully excluded. This lack of use is reflected in the habitat valuation, as while the habitats have physical features that could provide high quality habitat it would be inappropriate to attribute high values on the features in the absence of a long-tailed bat population that utilises them (Table 4-2).

Table 4-2: Bat habitat ecological values assessment.

Habitat type	Bat habitat description	Bat habitat value
WF9 taraire, tawa, podocarp forest	Mature and old-growth native trees within Cheesman's Bush and Puhinui Gully provide potential roost features, including cavities, hollows, cracks, crevices, flaking bark and epiphyte loads. Forest edges, gullies and stream corridors may also provide occasional commuting or foraging habitat if bats are present in the wider landscape.	Low
VS5 broadleaved species scrub / forest	Regenerating scrub / forest provides some edge and foraging habitat but generally lacks the large old trees and complex roost features associated with mature WF9 forest. Value is higher where it adjoins mature forest or stream corridors.	Low
EF.1 exotic forest with native understorey; TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland	Treeland and exotic forest may provide occasional roost substrate where mature exotic or native trees contain cavities, cracks, peeling bark or other roost features. These habitats may also provide edge habitat and local commuting structure.	Low
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Young or planted vegetation generally lacks suitable roost features but may provide low-quality foraging or commuting habitat, particularly where planting forms linear corridors or connects to riparian margins or forest remnants.	Low
ES exotic scrub, EG exotic grassland, open space, road corridor and hardstand	These habitats do not provide roost habitat. Grassland and scrub edges may provide occasional foraging habitat, but the absence of detected bat activity indicates limited functional value in the Project area.	Negligible

4.3 Avifauna

The avifauna assemblage recorded or expected within the Project area is typical of a modified rural, urban-fringe and remnant-forest landscape. Most species are common indigenous or exotic species. Threatened, At Risk, or otherwise notable species may occur as transient, seasonal or occasional users, including kākā, long-tailed cuckoo, bush falcon and New Zealand pipit. Tūī and kererū are Not Threatened but are ecologically important as pollinators and seed dispersers within indigenous forest ecosystems. The values of the avifauna species and habitat are provided in Table 4-3 & Table 4-4.

Table 4-3: Avifauna species ecological values assessment.

Species	Ecological value	Basis for value
Long-tailed cuckoo / koekoeā	Very High	Threatened species recorded in the wider area. Likely transient or occasional foraging use only.
Kārearea / bush falcon	Very High	Threatened species recorded in the wider area. Likely transient or occasional foraging use only.

Species	Ecological value	Basis for value
New Zealand pipit	High	At Risk – Declining nationally and regionally threatened. Potential habitat occurs in open grassland, particularly around Totara Park.
Kākā	Moderate	At Risk – Recovering and observed during site work. Small forest remnants are unlikely to support resident birds but may provide seasonal food resources and stepping-stone habitat.
Kererū	Moderate	Not Threatened, but ecologically important as a large-fruited seed disperser and contributor to forest ecological function.
Tūī	Moderate	Not Threatened, but ecologically important as a pollinator and seed disperser.

Table 4-4: Avifauna habitat ecological values assessment.

Habitat type	Avifauna habitat description	Avifauna habitat value
WF9 taraire, tawa, podocarp forest	Mature indigenous forest provides the highest value avifauna habitat in the Project area. It supports common native forest birds and provides seasonal foraging, roosting and stepping-stone habitat for mobile forest species such as kākā. The mature canopy, fruiting trees, flowering trees, epiphytes and forest structure provide nesting and foraging resources.	High
VS5 broadleaved species scrub / forest	Regenerating indigenous scrub / forest provides foraging, roosting and nesting habitat for common indigenous birds and contributes to habitat connectivity around mature forest remnants. It may also provide occasional seasonal resources for more mobile species.	Moderate
EF.1 exotic forest with native understorey; TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland	Woody vegetation, including exotic treeland and mixed treeland, provides foraging, roosting and nesting habitat for common native and exotic bird species. Value is mainly functional and contextual, as these habitats provide cover and stepping-stone resources in a modified landscape.	Low-Moderate
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Planted vegetation provides habitat for common native birds, particularly where plantings are older, structurally developed, native-dominated or connected to larger habitat patches. Younger or amenity plantings provide lower value habitat but may still contribute to local connectivity.	Low-Moderate
ES exotic scrub	Exotic scrub provides cover, foraging and nesting habitat for common birds and may function as a stepping-stone or buffer habitat. It is unlikely to provide core habitat for Threatened or At Risk bird species.	Low
EG exotic grassland and open space grassland	Grassland provides foraging habitat for common open-country birds. Rank or unmanaged grassland may provide potential nesting habitat for New Zealand pipit, but regularly grazed or mown grassland is generally unsuitable for nesting. Open grassland otherwise has limited avifauna value.	Low
Road corridor, hardstand and built surfaces	Built surfaces provide negligible avifauna habitat, although road margins and adjacent vegetation may be used by common species.	Negligible

4.4 Herpetofauna

Copper skinks were confirmed during the 2024–2025 site investigations. This species has a **High** ecological value based on its At Risk – Declining status. Other native lizards, including ornate skink, forest gecko, elegant gecko and Pacific gecko, may be present based on habitat suitability and wider landscape records, although they were not detected during surveys (Table 4-5). Lizard detectability is low, particularly for arboreal geckos and low-density populations. Habitat value has therefore been assessed using survey records, habitat structure, vegetation type, ground cover, canopy structure, disturbance history and pest animal pressure (Table 4-6).

Table 4-5: Herpetofauna species ecological values assessment.

Species	Ecological value	Basis for value
Copper skink	High	Confirmed present during manual searches and detected in eDNA from stream S04 in Totara Park. At Risk – Declining nationally and regionally declining. Habitat occurs across forest, scrub, planted vegetation and rank grass habitats.
Ornate skink	High	Potentially present where damp leaf litter, rock piles, woody debris and dense vegetation occur. At Risk – Declining, but not confirmed within the Project area.
Forest gecko	High	Potentially present based on previous unconfirmed gecko records and suitable arboreal habitat in mature forest, scrub and forest edges. At Risk – Declining.
Elegant gecko	High	Potentially present in forest and scrub habitats with suitable shrub and canopy structure. At Risk – Declining, but not confirmed during the 2024–2025 surveys.
Pacific gecko	High	Potentially present in forest, scrub, rock piles, crevices and structurally complex habitats. At Risk – Relict, but not confirmed within the Project area.
Plague skink	Negligible	Introduced and invasive non-native species recorded during ACO surveys. Not assigned indigenous ecological value, although its presence is relevant to existing habitat condition and competition pressure.

Table 4-6: Herpetofauna habitat ecological values assessment.

Habitat type	Herpetofauna habitat description	Herpetofauna habitat value
WF9 taraire, tawa, podocarp forest	Mature indigenous forest provides habitat for copper skink and potential habitat for ornate skink, forest gecko, elegant gecko and Pacific gecko. Important habitat attributes include deep leaf litter, coarse woody debris, shaded and humid forest floor, mature trees, epiphytes, vine tangles, bark crevices and complex canopy structure. Pest animal pressure and fragmentation are likely to reduce population densities.	High
VS5 broadleaved species scrub / forest	Regenerating scrub / forest provides suitable skink and potential gecko habitat where dense vegetation, leaf litter, woody debris and shrub structure are present. Habitat quality is variable and is reduced where weed dominance, canopy gaps, edge effects or pest animal pressure are high.	Moderate-High
TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland; EF.1 exotic forest with native understorey	Treeland and exotic forest provide lizard habitat where there is ground cover, leaf litter, woody debris, scrubby edges, bark features or arboreal structure. Value varies with vegetation complexity, degree of disturbance and connection to other habitats.	Low-Moderate
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Planted vegetation may provide lizard habitat where plantings have developed dense cover, leaf litter, woody debris and low vegetation structure. Younger or highly managed amenity plantings are generally lower value.	Low-Moderate
ES exotic scrub	Dense exotic scrub can provide suitable habitat for copper skink and possibly ornate skink where there is dense cover, leaf litter, woody debris and humid ground conditions. Botanical value is low, but habitat structure can be important for lizards.	Moderate
EG exotic grassland and open space grassland	Rank or unmanaged grassland can provide habitat for copper skink where dense grass, debris, logs, rubbish or rough margins provide cover. Managed grassland, mown areas and grazed pasture provide lower value habitat due to reduced cover and higher disturbance.	Negligible
Road corridor, hardstand and built surfaces	Built surfaces provide negligible habitat, although road edges, rubble, debris piles, retaining edges and unmanaged margins may provide localised refuge for copper skink.	Negligible

5 ASSESSMENT OF ECOLOGICAL EFFECTS

5.1 Overview

This section assesses the terrestrial ecological effects of the Project. The process of 'project shaping' in order to avoid and/or minimise effects of the Project where practicable is described below. The likely effects of construction and operation are also assessed, taking account of avoidance, minimisation and remediation measures. The remaining effects are then described as residual effects and recommendations to manage these residual effects are provided in Section 6.

5.2 Potential ecological effects

The construction and operation of the Project have the potential to affect terrestrial ecological values through vegetation and habitat loss, fragmentation, edge effects, disturbance, and fauna injury or mortality. Before the application of the effects management hierarchy, the main potential effects are:

- vegetation and habitat loss associated with vegetation clearance, earthworks and construction access;
- loss or damage to threatened and at-risk flora, including individual plants and, where relevant, the soil seed bank;
- loss or modification of native fauna habitat, including forest, scrub, rank grassland, tree, roost, nesting and refuge habitat;
- injury or mortality of native fauna during vegetation clearance or earthworks, including bats, birds, lizards and invertebrates;
- disturbance of fauna from construction noise, vibration, dust and lighting;
- habitat fragmentation and reduced ecological connectivity between forest remnants, scrub, grassland margins and riparian corridors;
- creation or intensification of edge effects, including changes to light, wind, humidity, weed pressure and vegetation composition along new or modified edges;
- changes to environmental conditions from roads, bridges and associated infrastructure, including shading, rain-shadow effects, altered drainage and stormwater discharge;
- ongoing operational disturbance from traffic noise, light, dust and human activity;
- fauna injury or mortality associated with road strike; and
- facilitation or exacerbation of pest plant and pest animal spread through disturbed ground, new edges, access tracks, machinery movements and altered habitat conditions.

The effects identified above can influence vegetation structure, microclimate, species movement and habitat suitability over time. Road edge effects are particularly relevant because road-related effects can extend some distance into adjacent native vegetation, depending on the effect pathway. Simcock et al. (2022) identify road effect zones of up to 500 m for effects such as noise, light, air pollution, weed invasion, habitat fragmentation and species displacement.

The likely extent of future edge effects for this Project will vary by location and effect type. Puhinui Gully and Cheesman's Bush are also already subject to existing edge effects because of their small size, shape, existing roads and surrounding residential land use. The assessment therefore considers both new edge effects and intensification of existing edge effects.

5.3 Design refinement and effects avoidance and minimisation

5.3.1 General design response

The Project design has been through multiple alternatives assessments and refinements to reduce effects on terrestrial ecology where practicable. The most important refinements relate to the bridge crossings at Puhinui Gully and Cheesman's Bush, and to the relocation or refinement of stormwater infrastructure.

The design refinements do not avoid all adverse effects. They do, however, reduce the scale or severity of some of the most severe effects, particularly effects on old-growth WF9 forests.

5.3.2 Bridge design and construction methods refinements

5.3.2.1 Puhinui Gully

The proposed design from 2016 provided for a bridge crossing at Puhinui Gully (SEA_T_4570) (Figure 5-1).

The current Project design (Figure 5-2) has been refined through option assessment and design development (further information in the alternatives assessment – Part C of the SAR). Key refinements include shifting the bridge alignment eastward, increasing bridge length to approximately 196 m through an additional span, refining the horizontal and vertical alignment, and reducing the bridge cross-section by removing active mode facilities. The purpose of this change was to minimise the impacts on Significant Trees and WF9 forest.

These changes have ecological trade-offs. While the new design avoids the removal of several important old-growth and large native trees, including a large tōtara and associated podocarp stand, and reduces effects on higher-value WF9 forest, it increases the total area of vegetation loss within the SEA. However, this loss now occurs primarily within broadleaved scrub (VS5), exotic scrub (ES) and exotic forest (EF.1). It now also requires realignment of the two streams within these two gullies the bridge crosses over. Although the extent of vegetation loss has increased, these vegetation types are considerably more replaceable than old-growth WF9 forest and the overall severity of effects is therefore reduced. Notwithstanding these refinements, the Project will still result in effects on SEA vegetation, VS5 scrub / forest, WF9 forest edges and lizard habitat.

5.3.2.1.1 Puhinui Gully Bridge construction methods

To construct this bridge, access into the gully is required to build the piers. This will require earthworks and associated vegetation clearance within the gully itself. This clearance, where practicable, will be on the eastern side of the bridge, away from the more sensitive and valuable WF9 vegetation and Significant Trees. Due to the need to maintain the bridge piers and potential requirements related to managing earth movement and bridge stability. For the purposes of this assessment, the clearance areas are not assumed to be able to be replanted and as such the construction footprint and bridge footprint is treated as a total, permanent loss in this assessment. It is highly likely that some of the area, slopes and riparian margins in this area will be planted and will be subject to refinement as construction methods and detailed design progress post consent. The clearance associated with this bridge is depicted in the impact extent mapped within APPENDIX E.

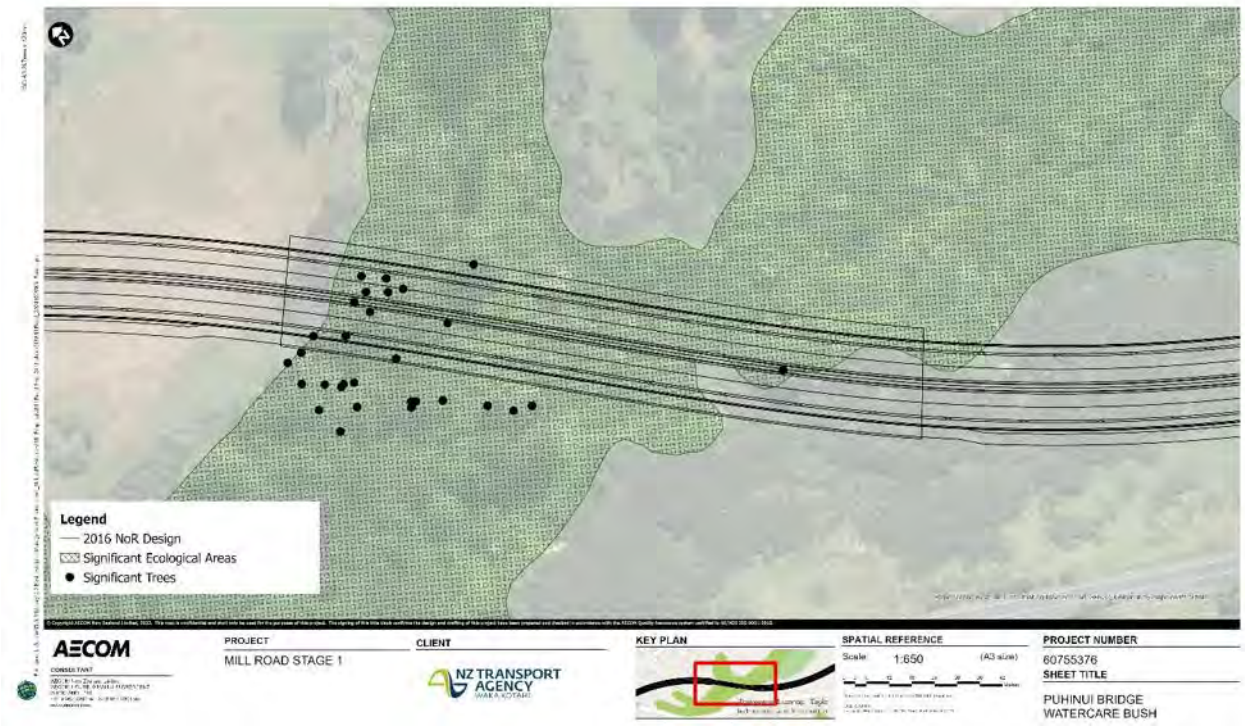


Figure 5-1: 2016 Puhinui Gully bridge location.

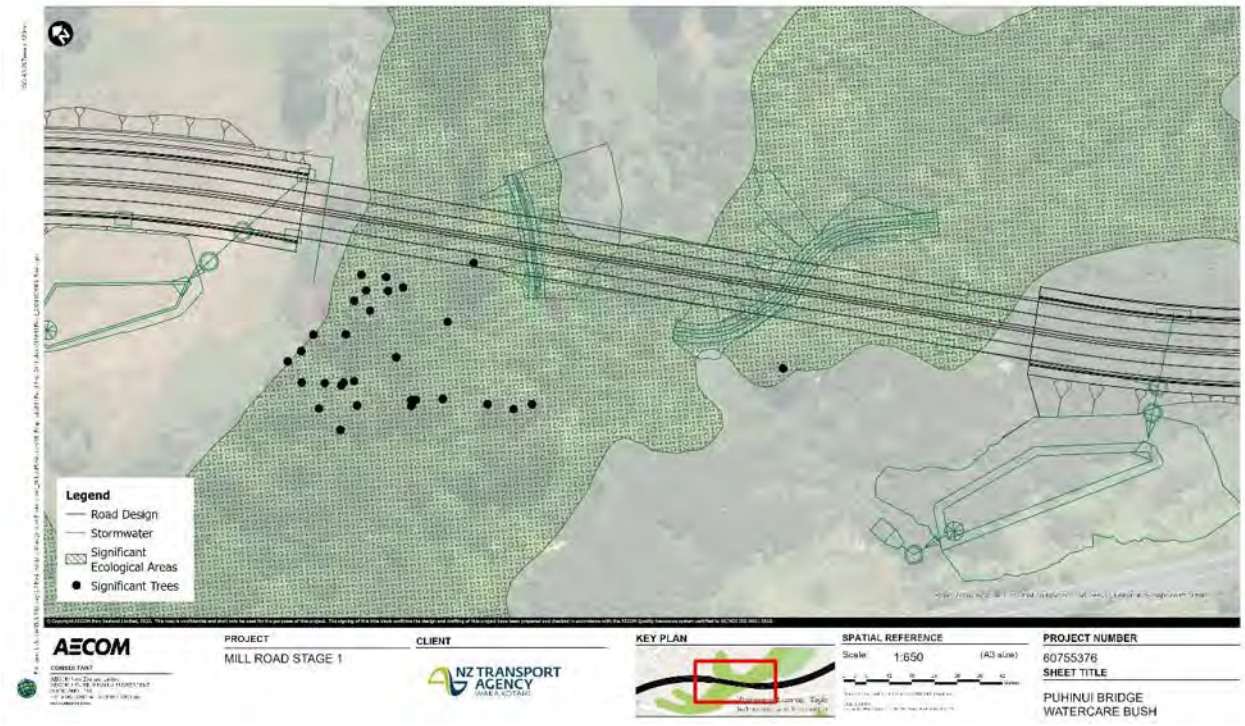


Figure 5-2: Proposed Puhinui Gully bridge location – current Consenting Design.

5.3.2.2 Cheesman's Bush

The 2016 designated alignment included a 40 m single-span bridge over Cheesman's Bush within SEA_T_9102, affecting taraire, tawa, podocarp forest (WF9) and broadleaved scrub/forest (VS5). In particular, the alignment would have required the removal of an old-growth pūriri (Tree 259).

As part of the Project refinement process, five alignment options were assessed through a multi-criteria analysis (MCA), including the designated alignment, three refinements to that alignment, and a 'full avoid' option that bypassed Cheesman's Bush entirely. The assessment concluded that the refinement options did not reduce ecological or arboricultural effects relative to the designated alignment, while the 'full avoid' option remained prohibitively costly and complex. As a result, effects on Significant Trees, including the old-growth pūriri (Tree 259), could not be completely avoided.

Notwithstanding this, the 2026 indicative design (Figure 5-3 & Figure 5-4) incorporates two refinements that reduce the Project footprint within SEA_T_9102 by increasing the bridge span from 40 m to 50 m, reducing the extent of earthwork embankments and abutment wall heights and removing active mode facilities, reducing the bridge cross-section by approximately 40%.

Collectively, these refinements reduce the area affected within SEA_T_9102 and the extent of vegetation and habitat loss associated with the bridge crossing.

5.3.2.2.1 Cheesman's Bridge construction methods

The construction methodology for Cheesman's Bush bridge incorporates the following measures to minimise ecological effects:

a) Establishing crane platforms on the bridge abutments in alignment with the Project works footprint at either side/end of the bridge (green shaded areas below in Figure 5-4). This enables crane operations to occur from the top of the gully, ideally with the crane swing radius limited to the southern side of the main alignment;

b) Ensuring that all platforms, or other such construction staging areas / 'work zones' (shaded brown), are located outside of SEA habitats, with crane operations again conducted from the top of the gully (ideally on the southern side) to minimise encroachment into the SEA and impacts on Significant Trees; and

c) Restricting the width and extent of any access tracks (where practicable) to construction areas associated with the bridge.

This approach removes the need to establish crane access within the gully adjacent to the proposed bridge, therefore avoiding direct vegetation clearance, soil disturbance, and associated SEA impacts within the gully floor that would have otherwise resulted.

Some modification of individual trees within the bridge envelope will be required to enable the safe operation of cranes and long-term bridge clearance. This will include the removal, topping, and trimming of some Significant Trees (APPENDIX B).

These works will result in permanent modification of canopy structure within the bridge footprint, changes to light availability, water regime, air movement and a reduction in the availability of upper-canopy habitat features.

Over time, the forest beneath the bridge is expected to stabilise as a lower-stature canopy with altered species composition and structure.

Accordingly, the adopted construction approach represents an avoidance and minimisation measure that reduces ecological effects relative to alternative construction methods requiring direct access or clearance within the gully. This approach maintains connectivity within the feature for less mobile species such as lizards and invertebrates. It also functions to minimise the edge effects that would be associated with wholescale vegetation removal through the entirety of this bridge footprint area.

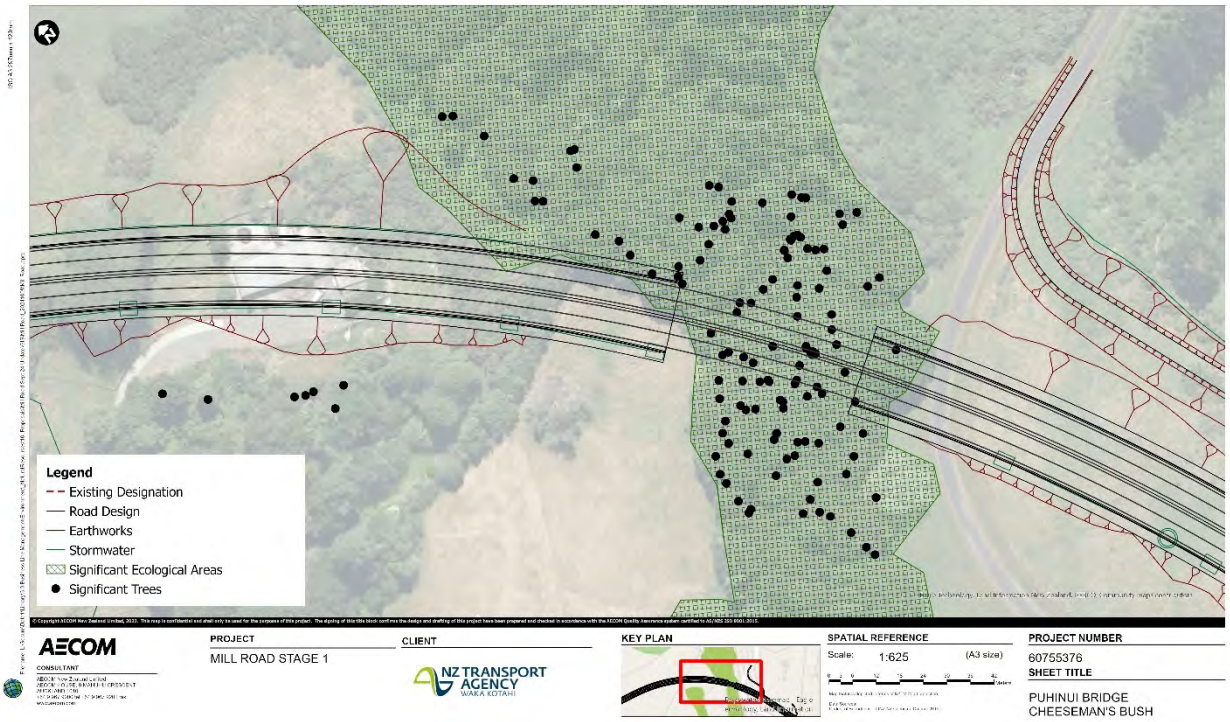


Figure 5-3: Cheesman's Bush Bridge – current Consenting Design

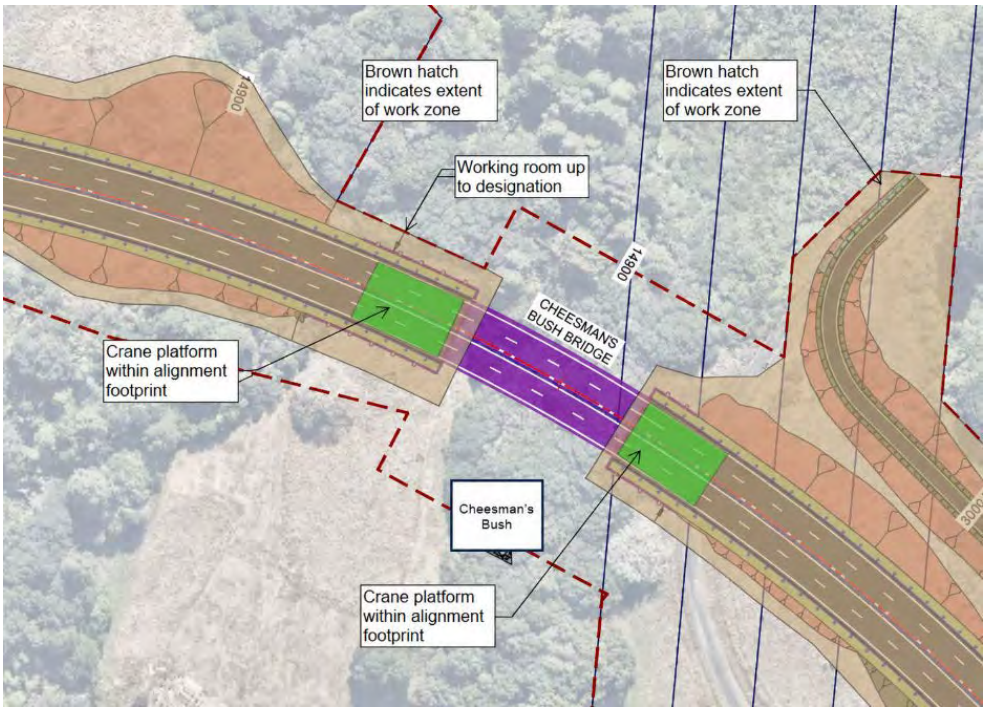


Figure 5-4: Indicative Cheesman's Bush bridge construction method diagram

5.3.3 Operational maintenance of vegetation – bridges

Both the Puhinui gully and Cheesman's bush bridges will have the same operational vegetation maintenance requirements. The vegetation will need to be maintained trimmed/removed inside an envelope area of 5 m of each side of the bridge deck and within 2 m of the bottom of the bridge deck. This report refers to these areas as 'vegetation maintenance zones'. The vegetation maintenance zone is depicted in the typical cross sections in Figure 5-5 & Figure 5-6.

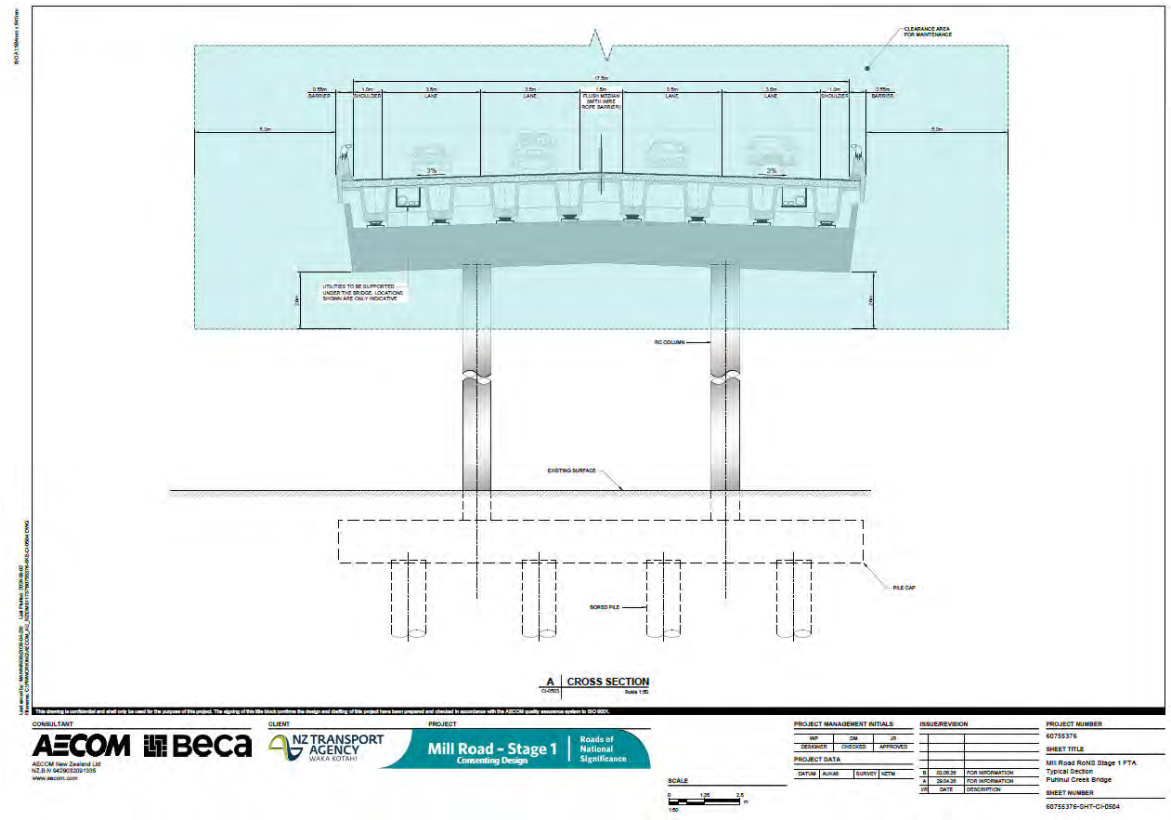


Figure 5-5: Typical cross section of Puhinui Creek bridge showing operational maintenance zone requirements. Blue zone is required operational vegetation clearance zone.

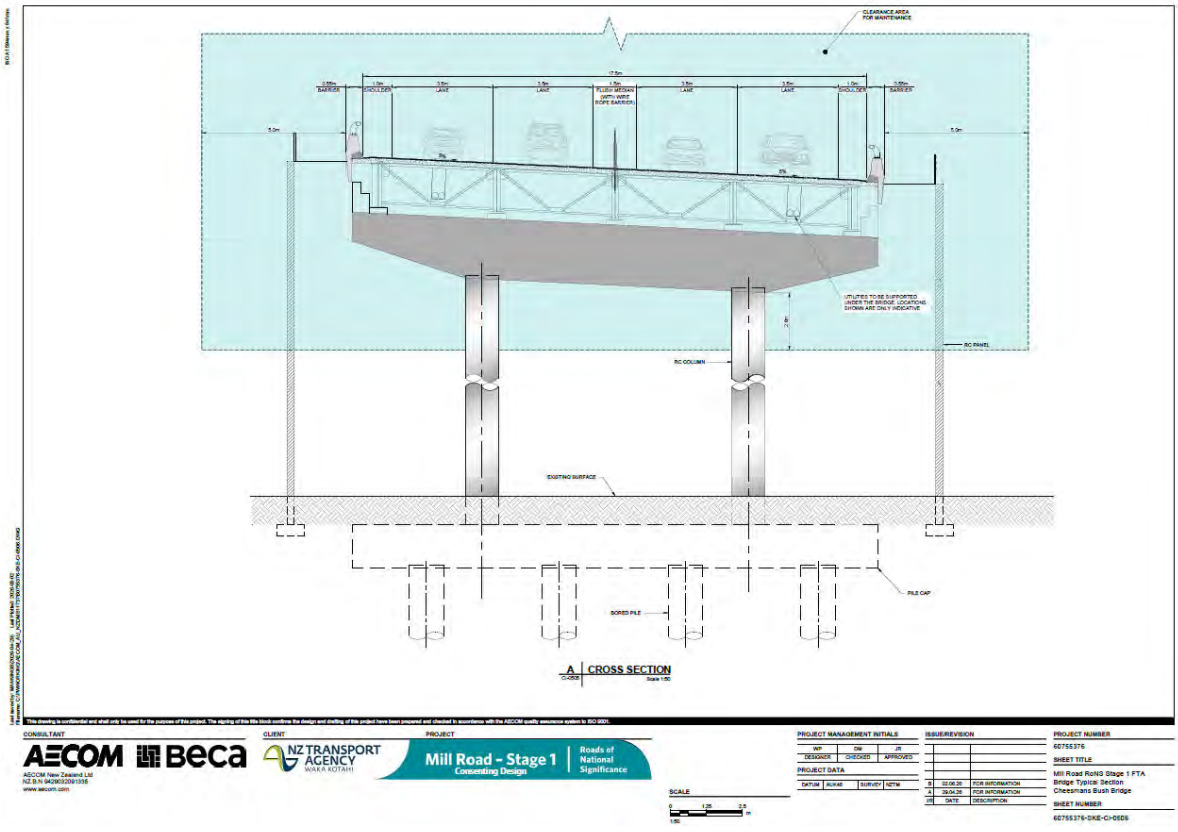


Figure 5-6: Typical cross section of Cheesman's Bush bridge showing the vegetation maintenance zone requirements shaded in blue.

5.3.4 Stormwater infrastructure

The stormwater design has also been refined to reduce the potential effects on terrestrial values. In particular, stormwater infrastructure that would have affected Cheesman's Bush SEA has been moved outside the SEA into the adjacent gully at 134 Mill Road. Stormwater manholes have also been relocated outside Puhinui Gully SEA where practicable. The proposed stormwater outfall at Everglade Park / Kingsclere Place Reserve has been refined to avoid direct impacts on large mature tōtara, with effects concentrated on regenerating or edge planting within the SEA extent.

These refinements reduce the scale of direct vegetation loss in higher value areas. However, the stormwater works still contribute to vegetation clearance or modification, edge effects, and localised habitat disturbance.

5.4 Habitat loss and modification

5.4.1 Habitat/vegetation loss

I have based the quantification of vegetation/habitat loss on the indicative design footprint, which is defined by the permanent infrastructure footprint, the civil construction footprint and the more detailed vegetation impact areas associated with the two bridges.

The areas of assessed vegetation loss are depicted in APPENDIX E. The approximate terrestrial habitat loss and modification assessed for the Project is summarised in Table 5-1. In terms of native vegetation, the construction of the road will cause the loss of 0.189 ha of WF9, 0.499 ha of VS5, 0.178 ha of TL.2, PL.2 & PL.3, and 0.058 ha of EF.1 with a native understorey.

Table 5-1: Approximate in scope terrestrial habitat loss extents.

Vegetation type	Area of in scope vegetation not directly impacted by the indicative design (ha)	Approximate extent of in scope vegetation directly impacted by the indicative design (ha)	Total area of in scope vegetation in proposed designation (ha)
WF9 Taraire tawa podocarp forest	5.416	0.175	5.590
VS5 Broadleaved scrub	1.174	0.499	1.674
TL.2 Mixed native treeland	0.099	0.112	0.211
PL.2 Planted native >20 years	0.013	0.064	0.077
PL.3 Native or amenity plantings	0.008	0.001	0.010
EF.1 Exotic forest with native understorey	0.224	0.058	0.283
ES Exotic scrub	0.655	0.173	0.828
TL.3 Exotic treeland	0.262	0.094	0.356
EG Exotic grassland	0.018	0.000	0.018
WF9 Taraire tawa podocarp forest (134 Mill Road)	0.655	0.014	0.669
Totals	8.5	1.2	9.7

5.4.2 Habitat modification of WF9 and VS5 vegetation under and adjacent to bridges

The areas of WF9 and VS5 vegetation outside the bridges' earthworks footprint, but likely to be modified during bridge construction or ongoing vegetation maintenance, are summarised in Table 5-2. The

following figures (Figure 5-7 to Figure 5-18), illustrate the interaction of the bridge, vegetation canopy and vegetation maintenance zones.

The majority of the vegetation underneath and 20 m to the northeast side of the Puhinui Gully bridge is assumed to be totally removed and not assumed to be replanted. This vegetation loss has been accounted for in Section 5.4.1 above. Only small areas along the southwestern side of the bridge are not subject to removal, but are still located within the vegetation maintenance zone and therefore vegetation in this area may require topping or trimming (Figure 5-7 & Figure 5-8).

The vegetation most impacted in this zone is the WF9 vegetation on the Western side at the north end of the bridge where this vegetation is higher stature and interacts with the bridge and vegetation maintenance zone. This WF9 vegetation occurs at the end of the bridge when its height is lowest compared to ground level and vegetation management in this location is expected to be close to total loss due to the extent of modification and rain and light shadowing. The majority of the remaining area under the bridge and vegetation management zone clears the vegetation canopy this is depicted in Figure 5-9 to Figure 5-11. The areas of VS5 vegetation along the western side of the bridge are likely to be subject to a minor amount of rain shadowing but being on the southern side of the bridge light shadowing is expected to moderate.

At Cheesman's bridge construction does not occur directly within the majority of the gully and the vegetation impacts will not be total removal. The bottom of the bridge deck occurs approximately 14 to 16 m above the gully floor (Figure 5-12 to Figure 5-14). With the bridge being considerably closer to ground level at either end. The height of the vegetation in this gully, particularly on the southern side of the gully means the bridge directly interacts and requires considerable modification of the vegetation (Figure 5-15 & Figure 5-16). When considering the vegetation maintenance zone this interaction increases on the side and below the bridge[3] (Figure 5-17 & Figure 5-18). I expect the modification of the vegetation in this location to be considerable, nearing total loss at either end of the bridge due to severely reduced height and rain and light shadowing. Nearing the centre where an approximate 12 to 14m canopy height can be maintained the impact is less severe and a lower stature subcanopy vegetation may be retained or develop and stabilise over time.

Table 5-2: Approximate extent of vegetation modified due to vegetation maintenance zone requirements associated with both bridges.

Vegetation type	Approximate area of in scope vegetation modified to construct and operate the bridges (including the vegetation maintenance zones) (ha)	Description of likely impact
WF9 Taraire tawa podocarp forest – Puhinui Gully	0.0138	Approaching total loss. For the purposes of this assessment assumed total loss.
VS5 Broadleaved scrub – Puhinui Gully	0.0161	Minor impacts of rain and light shadowing for the majority of the area. Small area at the southern end of the bridge where heights are lower more severely impacted. Canopy in the future expected to continue to increase in height but be maintained at a sub-canopy vegetation type.

[3] Note this is quite hard to depict and our best endeavour has been to depict the interaction of the features discussed within the limits of what can be shown with an image of a 3D model.

Vegetation type	Approximate area of in scope vegetation modified to construct and operate the bridges (including the vegetation maintenance zones) (ha)	Description of likely impact
WF9 Taraire tawa podocarp forest – Cheesman's bush	0.1107	Initial severe vegetation modification required, and total loss assumed for approximately a third of the vegetation where it occurs close to the bridge abutments. Within the centre of the gully post vegetation modification a sub-canopy vegetation type is expected to stabilise. Rain and light shadowing is also expected to influence vegetation composition to reflect a subcanopy composition.



Figure 5-7: Puhinui Gully Bridge. Black outline is the extent of civil earthworks. Purple hashed overlay is subject to removal as part of construction and within the vegetation maintenance area. Infilled grey areas are the areas where vegetation is subject to clearance as part of construction removed but subject to the vegetation maintenance zone.

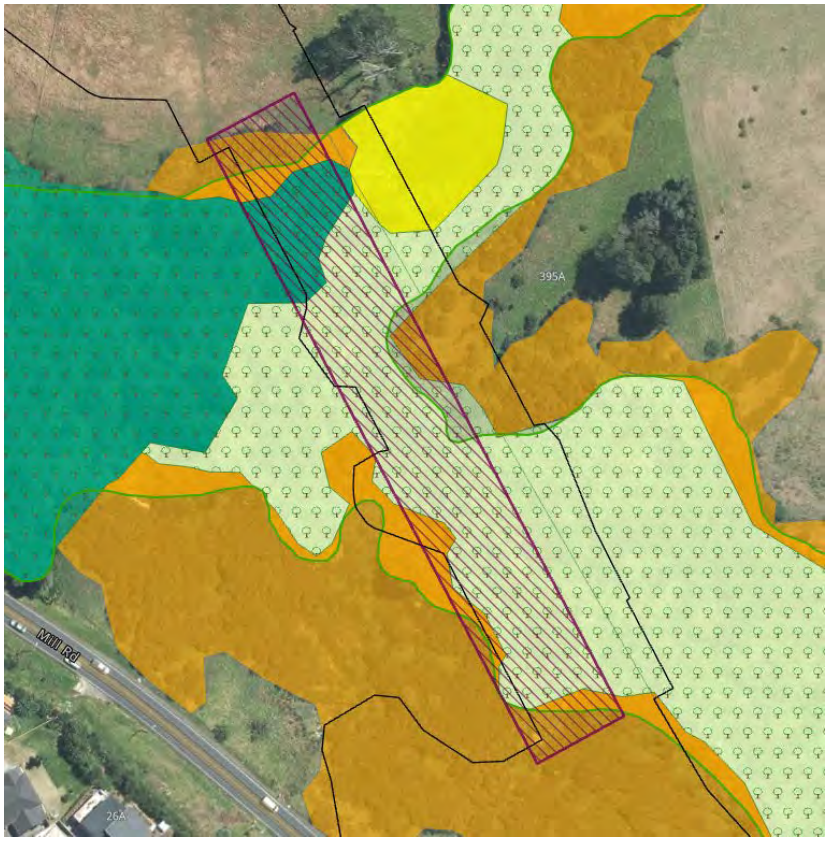


Figure 5-8: Puhinui Gully. Vegetation types within this area – Oranges is ES – Exotic Scrub, Yellow is EF.1 Exotic forest with native understory, Light green is VS5 - Broadleaved scrub, Dark green is WF9 - Taraire tawa podocarp forest. Black outline is the extent of civil earthworks. Infilled grey areas are the areas where vegetation is not totally removed but subject to the vegetation maintenance zone.

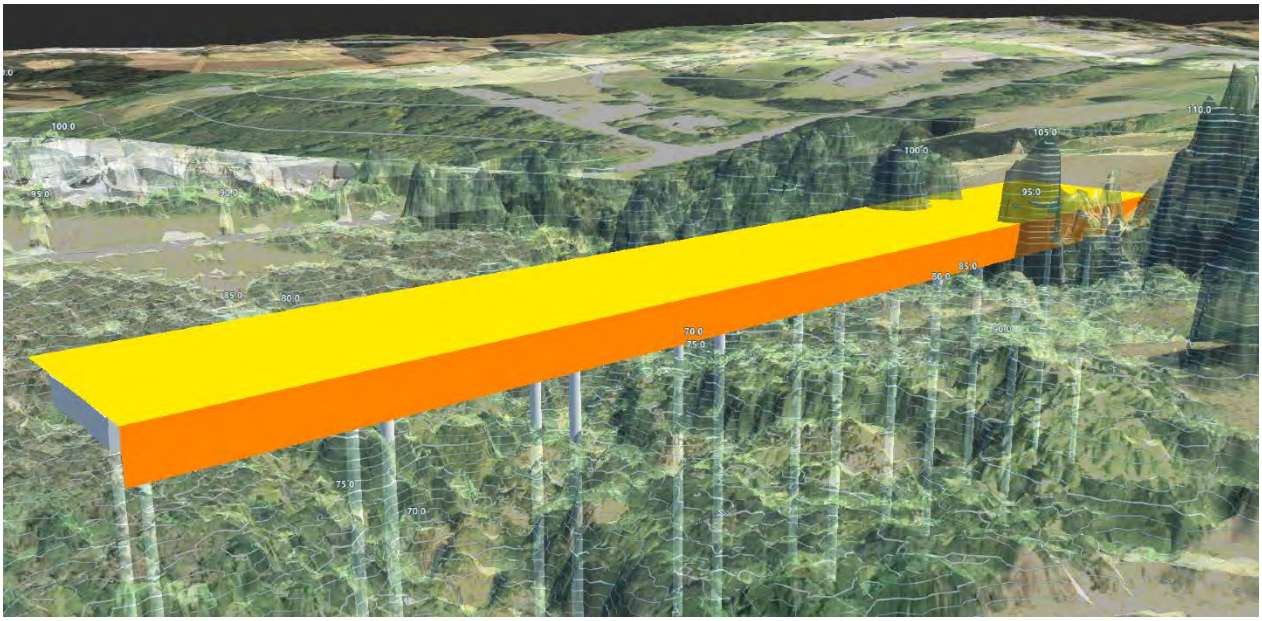


Figure 5-9: Puhinui bridge down gully view. Lidar captured vegetation heights showing interaction with the bridge. Solid yellow box around bridge shows extent of the vegetation management zone.

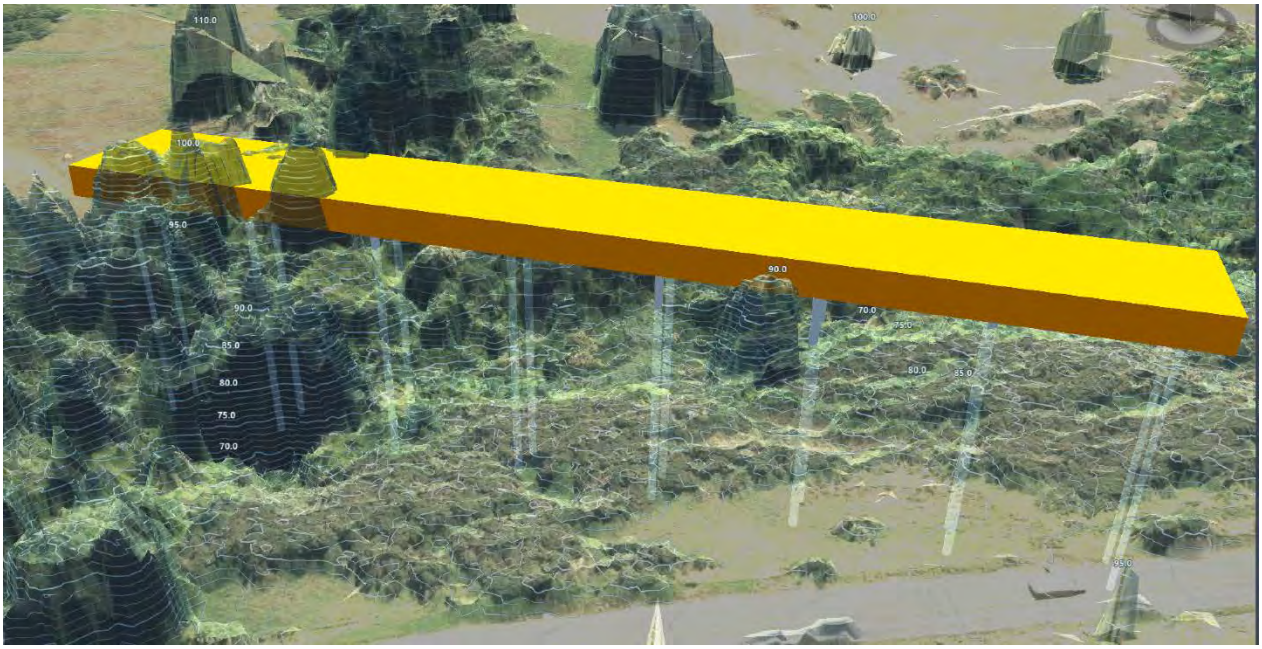


Figure 5-10: Puhinui bridge up gully view. Lidar captured vegetation heights showing interaction with the bridge. Solid yellow box around bridge shows extent of the vegetation management zone.

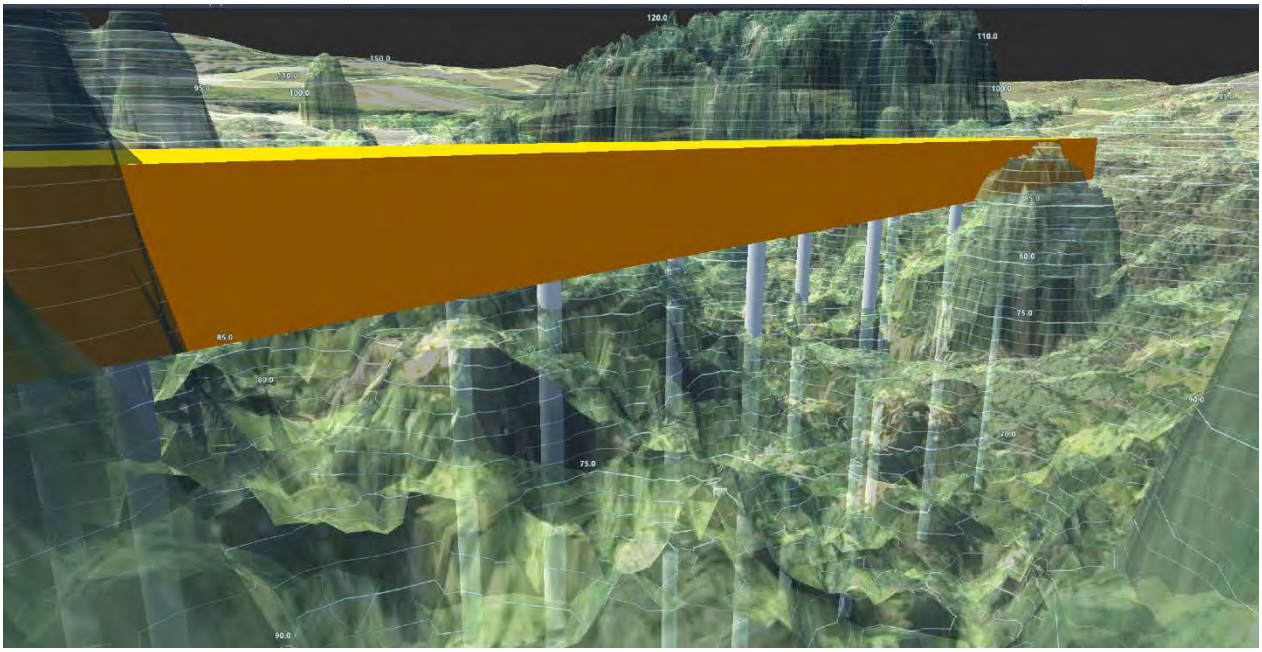


Figure 5-11: Puhinui bridge down low view from area of WF9 on Southwestern side of the bridge. Lidar captured vegetation heights showing interaction with the bridge. Solid yellow box around bridge shows extent of the vegetation management zone.

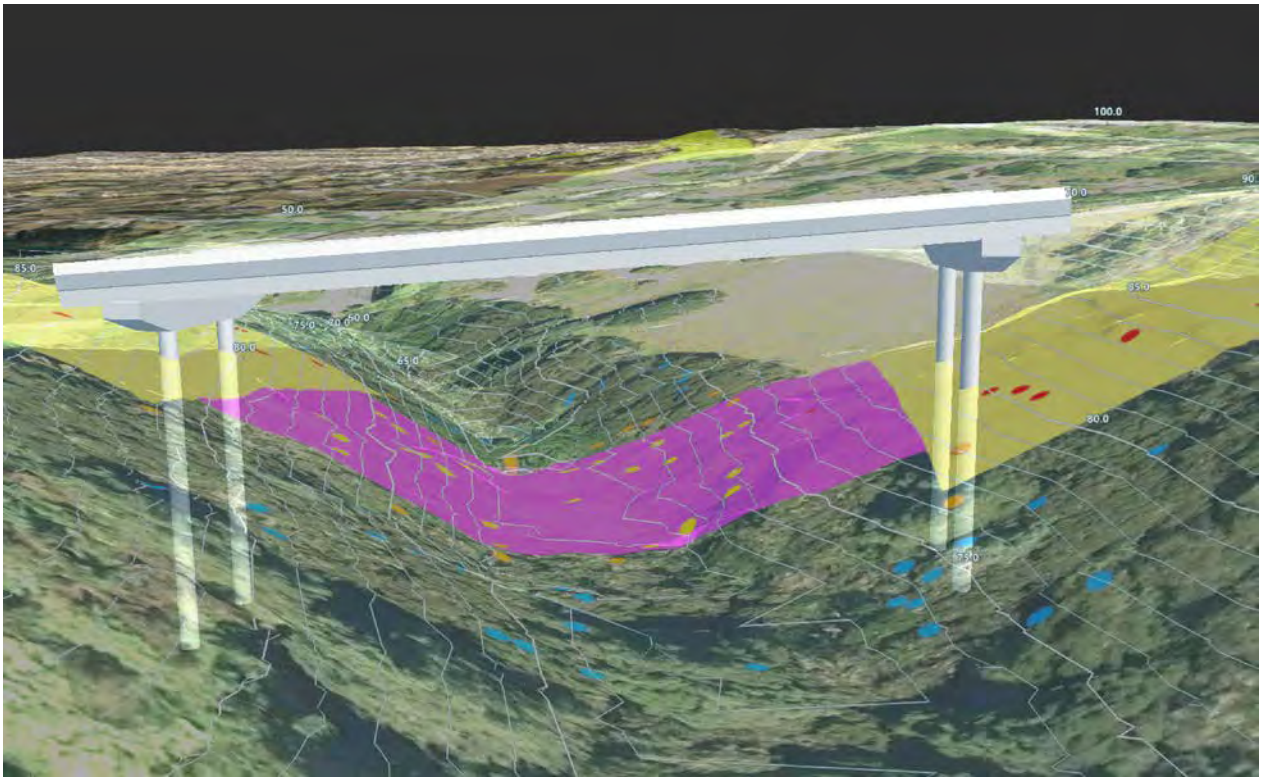


Figure 5-12: Cheesman's bridge looking down valley. Ground layer only. Yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone.

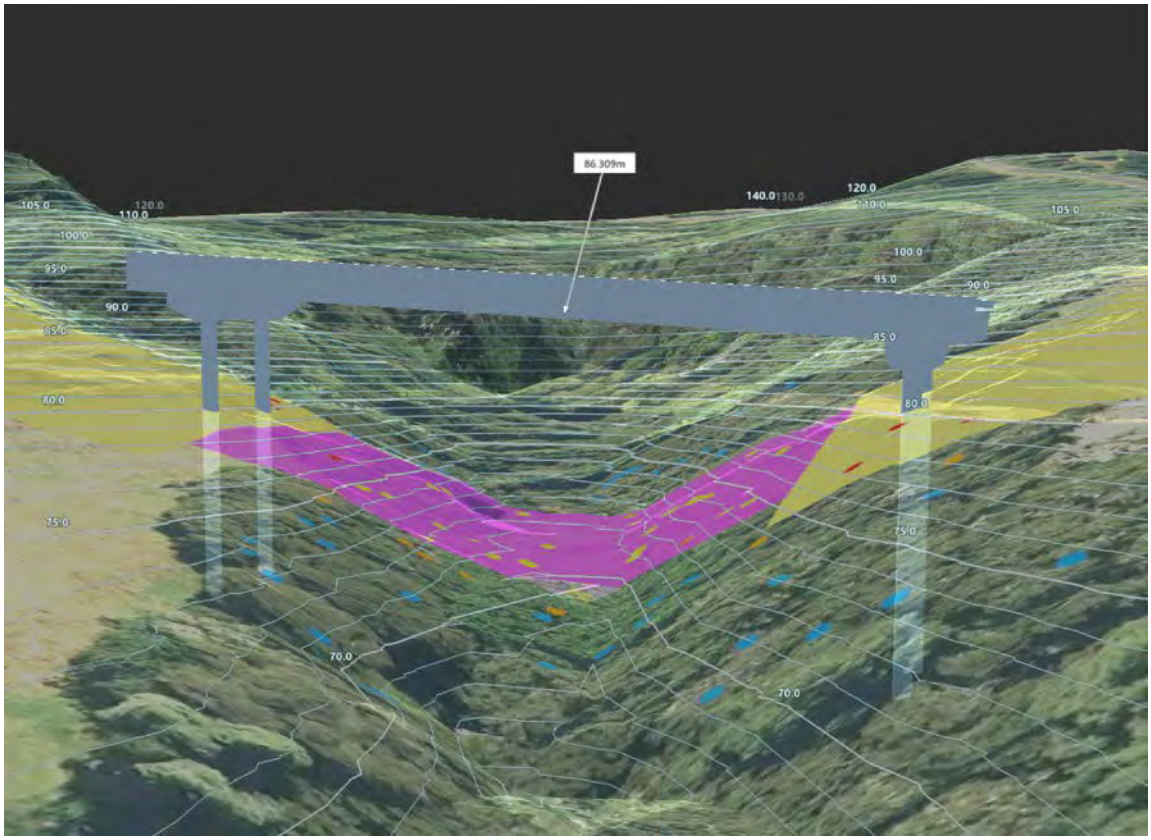


Figure 5-13: Cheesman's bridge looking up valley. Ground layer only. Yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone.

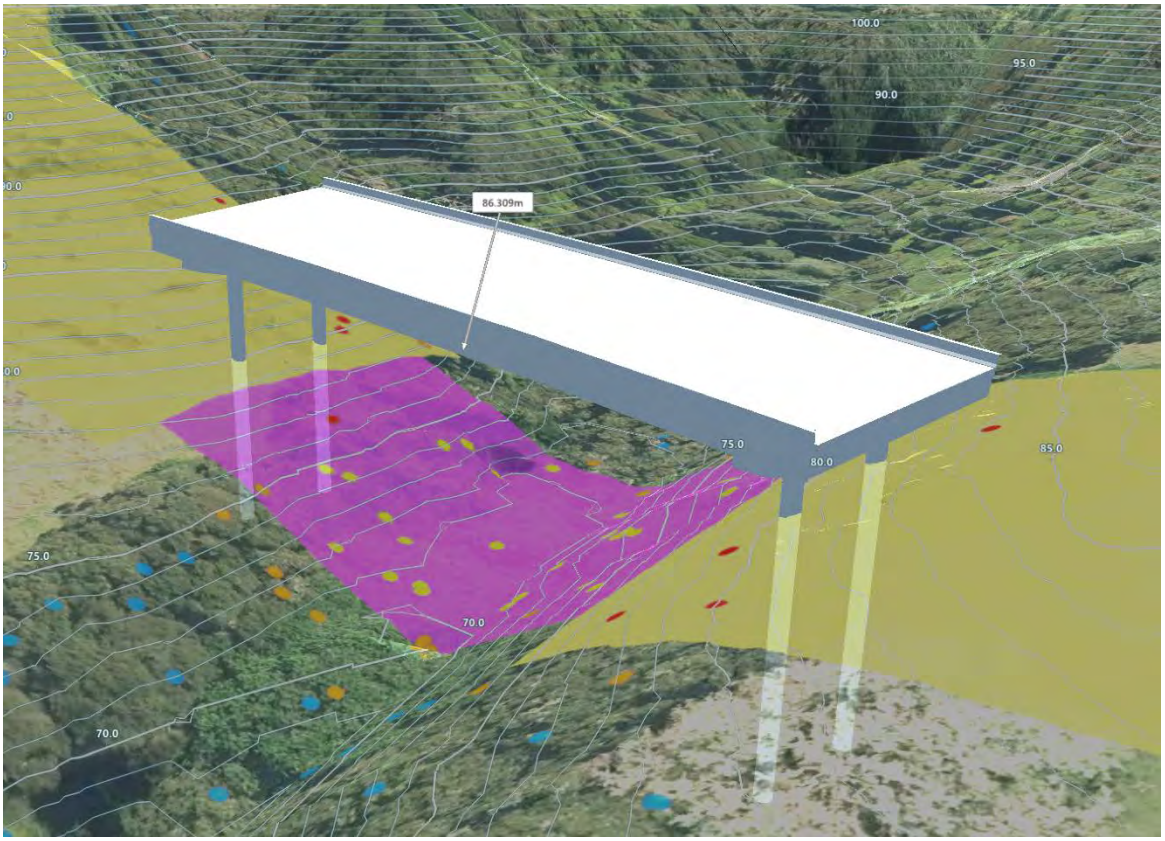


Figure 5-14: Cheesman's bridge looking up valley – oblique view. Ground layer only. Yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone.

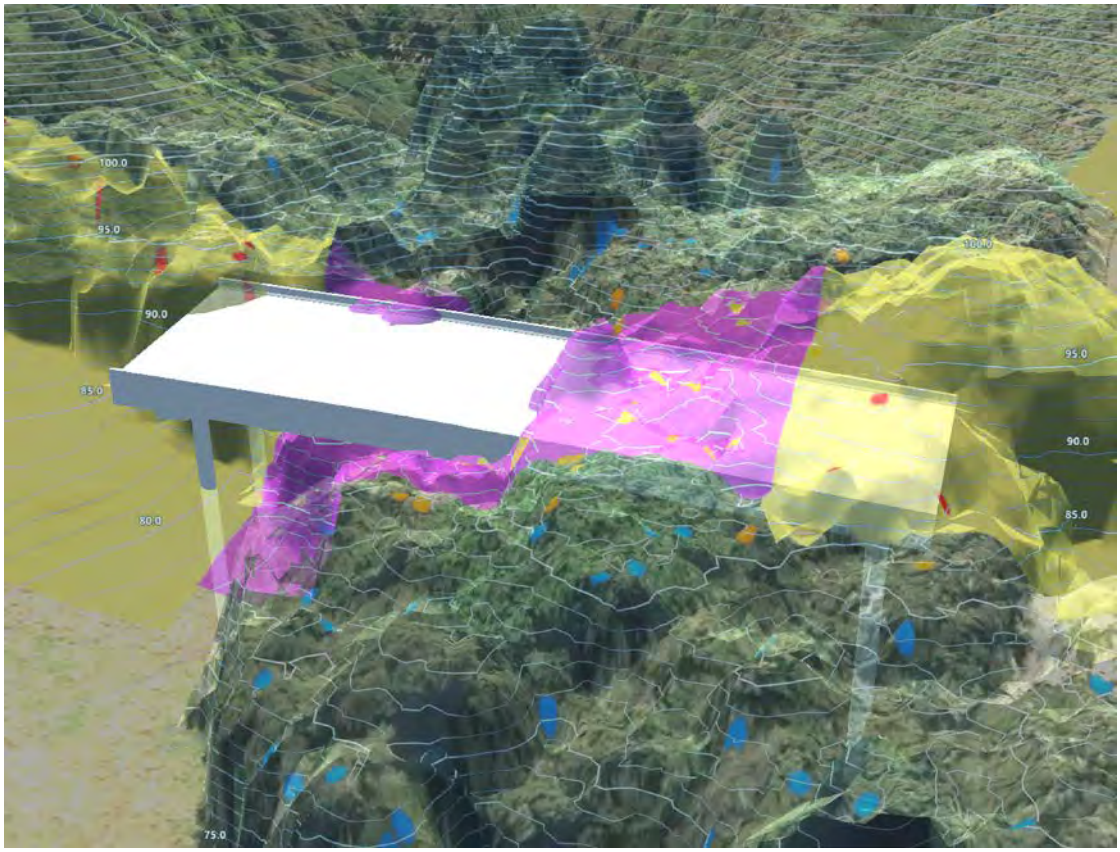


Figure 5-15: Cheesman's bridge looking up valley. Lidar captured vegetation heights showing interaction with the bridge. Yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone.

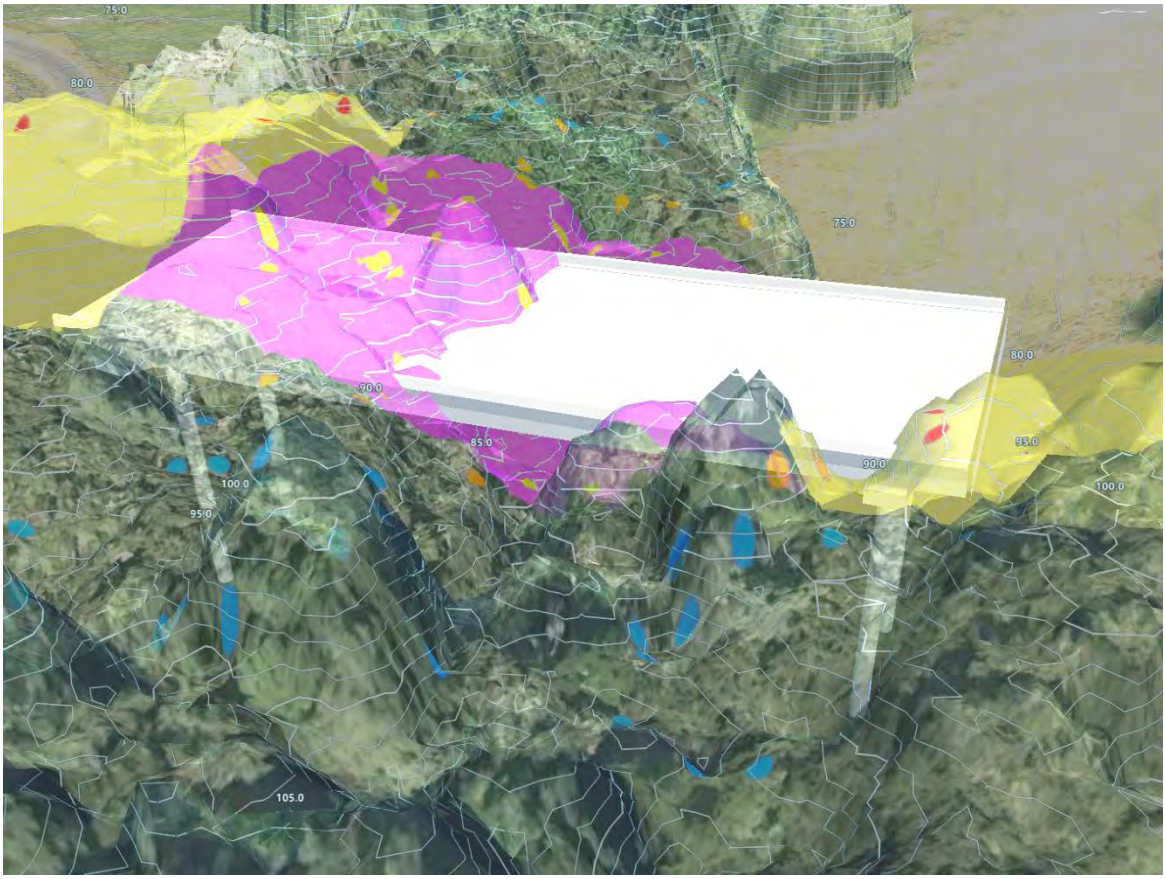


Figure 5-16: Cheesman's bridge looking down valley. Lidar captured vegetation heights showing interaction with the bridge. Yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone.

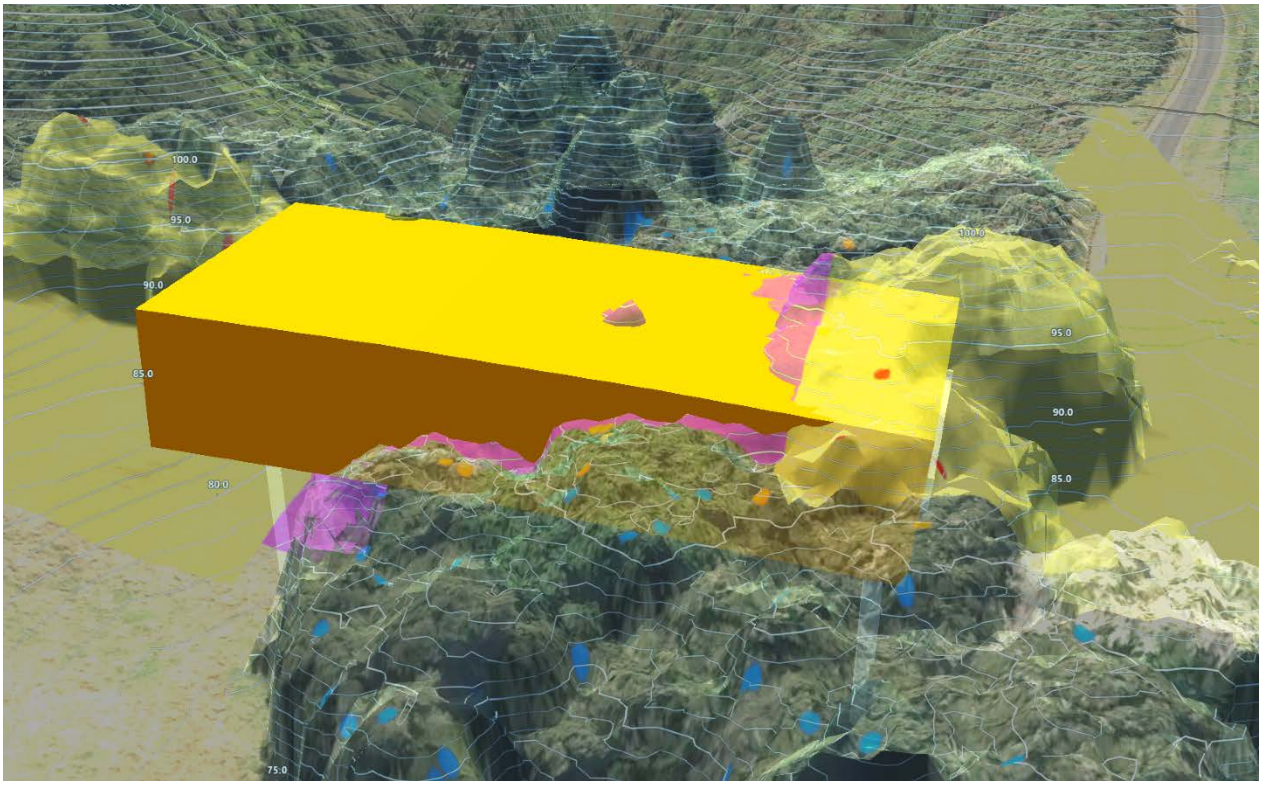


Figure 5-17: Cheesman's bridge looking up valley. Lidar captured vegetation heights showing interaction with the bridge. Transparent yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone. Solid yellow box around bridge shows extent of the vegetation management zone.

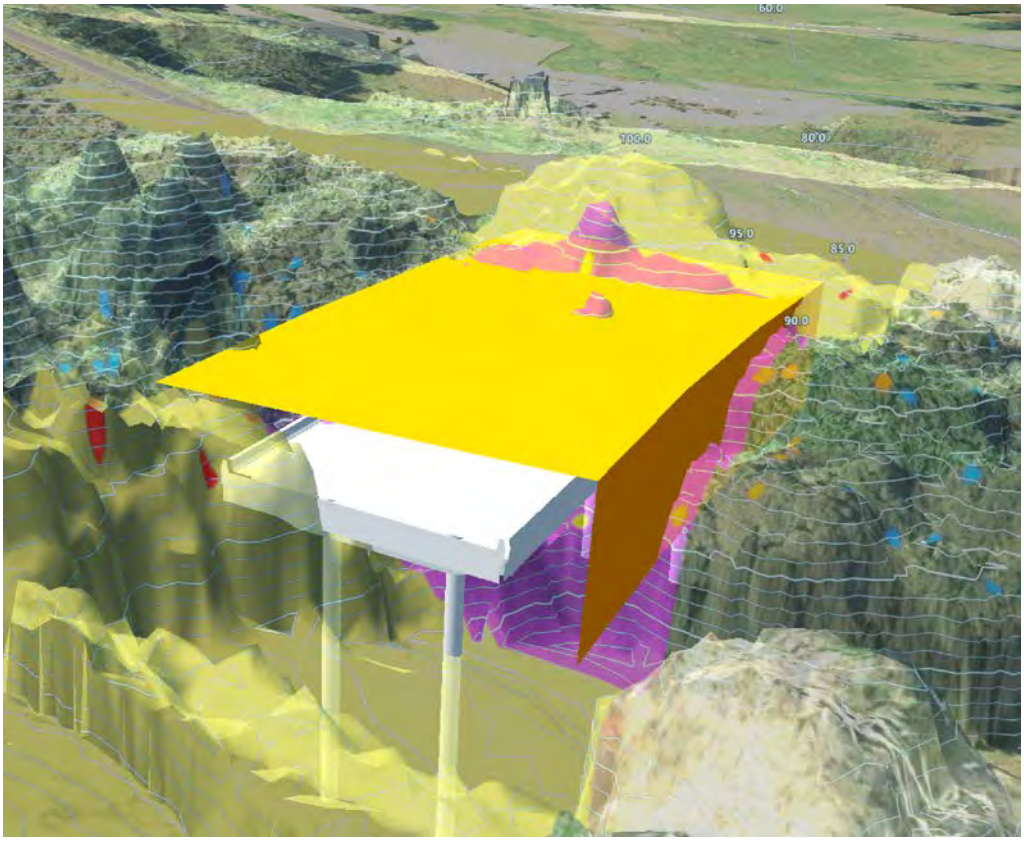


Figure 5-18: Cheesman's bridge oblique view. Lidar captured vegetation heights showing interaction with the bridge. Transparent yellow overlay = earthworks extent. Purple overlay is 2D spatial extent of vegetation maintenance zone. Solid yellow box around bridge shows extent of the vegetation management zone.

5.5 Effects avoidance, minimisation and remediation measures during construction

The Project has been designed to avoid or minimise adverse effects on terrestrial values to the extent practicable through design refinements (as set out above). Residual effects include the direct loss of 0.924 ha of in scope native dominated (and/or native dominated understorey) vegetation and permanent modification of 0.1245 ha of WF9 and 0.0161 ha of VS5 vegetation associated with areas outside of the civil construction footprint but inside the areas of the vegetation management zones of the bridges. In addition to these areas of vegetation the Project will result in the loss of 0.267 ha of non-native in scope vegetation which provides habitat for copper skink.

Further and detailed avoidance and minimisation measures specific to habitats and fauna species are detailed in the Terrestrial Management Plan (TMP) comprising several management plans, along with a separate Lizard Management Plan (LMP). This management plan framework is summarised below.

- Vegetation Clearance Protocol (VCP)
    - Threatened and At Risk (TAR) plant surveys and salvage will be undertaken to identify any TAR plants within the SEAs. Identified individuals will be marked with flagging tape or temporary fencing to ensure they are avoided during works or prepared for translocation where necessary. Monitoring of the TAR plants will be included in the construction and operational phases to ensure their continued health.
    - Physical delineation of the Project Footprint by a surveyor to avoid unnecessary vegetation loss outside the footprint.

- Salvaging and relocating of habitat features (e.g. wood,) where practicable, to available rehabilitation areas, and lizard relocation sites, otherwise their storage in stockpiles for later deployment to rehabilitation or offset/compensation sites.

- Where native trees are felled or topped, retained stems, trunks and large limbs, that are not proposed to be made available to mana whenua for their use, should be left in situ or relocated within the restoration / rehabilitation areas where practicable. This will provide coarse woody debris and invertebrate, lizard and fungal habitat. These actions do not fully remedy the loss of mature trees, but they reduce the loss of ecological function.

- Old Growth Tree Management Plan (OGTMP):

  - Removal of Significant Trees will be restricted to those identified on the drawings included in the OGTMP;

  - Trimming and topping of Significant Trees within the SEAs will be managed; and

  - Disturbance of all other vegetation within SEAs will be minimised during construction of the Project.

- Avifauna Management Plan (AMP)

  - Vegetation clearance should be avoided during peak bird breeding season from September – December inclusive where practicable. Where this is not practicable, nesting bird survey protocols will be undertaken to avoid or minimise effects on native birds within terrestrial habitats. These protocols should also take place during non-peak bird breeding season (January to March inclusive). Protocols include the surveying of indigenous bird nests prior to vegetation clearance and establishment of no clearance buffers to minimise risk to native bird nests, eggs and chicks. No vegetation clearance will be permitted until chicks have fledged as per the guidance below:

    - Within 50m for pipit or any other nationally or regionally 'Threatened' or 'At Risk' bird species; and

  - 30m for all indigenous bird species with a national or regional non-threatened classification.

- Bat Management Plan (BMP)

  - To ensure that bats are not present within the area of works at the time of vegetation clearance and the assessed effects remain negligible, a bat acoustic survey designed by a suitably qualified bat ecologist should be carried out within the Proposed Designation within 12 months of the start of any construction or enabling works that require the removal of vegetation types that may contain bat roosts (WF9, VS5, EF.1, TL.3).

  - The survey must be undertaken between October 1 and April 30 inclusive and should include at least 14 nights of suitable weather conditions as defined in the Department of Conservation Bat Roost Protocols (Bat Recovery Group - Department of Conservation, 2024).

  - Should this survey detect bats implementation of vegetation removal protocol, including surveying of trees for potential bat roost features, and checking trees with bat roost features for roosting bats pre-clearance. Trees will not be felled until no roosting bats are confirmed. This process should follow the current best practice for tree fell protocols to avoid and minimise harm of long-tailed bats.

- Habitat Restoration and Enhancement Plan (HREP)

  - The HREP includes a targeted weed control programme within Cheesman's Bush and Puhinui Gully SEAs to support rehabilitation of impacted areas and to enhance habitat quality for native flora and fauna. Weed control will focus on the suppression and removal of high-risk invasive species that compete with native forest regeneration (including tradescantia, woolly nightshade, privet, and pampas). Control will follow best-practice methods appropriate to each weed species and will be undertaken prior to planting and maintained throughout the 10-year management period. Ongoing surveillance and follow-up control will be implemented to ensure low weed prevalence and to promote successful establishment of native plantings and restored habitat.

- Recommended ecological rehabilitation remediation measures are detailed in the HREP. Noting that I have assumed no such remediation to occur in any one area as part of the effects assessment. This plan sets out how habitats that are temporarily impacted within the Project Footprint can be ecologically rehabilitated via native revegetation and habitat enhancement.

- Details how rehabilitation outcomes within the Project Footprint as shown on the landscape planting plans, are recommended to be supported by ongoing management actions including targeted pest plant control, establishment of salvaged and nursery-grown plants, and facilitation of natural establishment and spread of targeted native plants, including control of competing plants and specific micro-site preparation if needed.

    - A 10 year pest animal control and monitoring programme will be implemented within the extent of Cheesman's Bush, Puhinui Gully SEAs, and the WF9 vegetation within 134 Mill Road within the proposed designation and new areas of restoration planting proposed within this assessment within the proposed designation. This programme is specifically designed to prevent further habitat degradation, support regeneration of the vegetation, and increase the resilience of fauna populations within the features. Pest monitoring including seasonal tracking tunnel and chew card surveys, as well as camera monitoring for mustelids, possums and hedgehogs, will guide adaptive management to ensure predator densities remain at levels that protect relocated lizards.

- Lizard Management Plan (LMP)

    - The LMP identifies salvage areas, release areas, habitat enhancement areas, timing, capture methods, minimum salvage effort, handling requirements, storage and transport procedures, release protocols, pest control requirements and post-release monitoring. It should also specify what happens if additional native lizard species are found during salvage.

    - Recipient habitats should be prepared before salvage begins. Preparation should include installation of refuge material, coarse woody debris, rock or log piles where appropriate, dense groundcover or shrub structure, weed control and pest animal control. Release areas should be located away from active construction zones and should be large enough and of sufficient quality to support relocated animals without creating excessive release density.

    - Post-release monitoring should be used to assess whether lizards remain detectable within release areas, whether habitat condition is being maintained, and whether pest animal control and weed control are sufficient. Monitoring results should be reviewed by the project ecologist and should trigger management if release habitat is not performing as intended.

    - The primary detail for proposed pest control will reside in the HREP. However, these measures will also support the success of lizard translocation by maintaining very low densities of key lizard predators (rats, mice, mustelids and hedgehogs) and will follow best practice methods to maintain low pest densities across the duration of the programme.

5.6 Magnitude and level of residual ecological effects

5.6.1 Terrestrial vegetation

The magnitude of residual effects on terrestrial vegetation and habitat values is summarised in Table 5-3.

Table 5-3: Magnitude of residual effects on terrestrial ecosystems

Value	Ecological value	Magnitude of residual effect	Level of ecological effect	Assessment
WF9 taraire, tawa, podocarp forest	Very High	Moderate	High	The Project will result in permanent loss or substantial modification of approximately 0.313 ha of WF9 forest. The proportional loss is small at a regional scale but locally important because the affected remnants are small, mature, fragmented and part of a depleted lowland forest resource. The loss includes mature forest structure and habitat functions that cannot be fully recreated in the short or medium term. Remediation planting may restore some functions over time but will not replace mature forest values within the relevant timeframe.
VS5 broadleaved scrub / forest	Moderate	Moderate	Moderate	The Project will affect approximately 0.515 ha of VS5 habitat. This habitat is more modified and weed-affected than WF9 but still has high ecological value as regenerating indigenous scrub / forest and fauna habitat. The effect is moderate because the loss is locally meaningful and contributes to fragmentation and edge effects, although the habitat is more replaceable than mature WF9 forest.
Significant Trees Also refer to the arboricultural report (APPENDIX B)	Very high	High	Very high	The Project will result in the loss, topping, trimming, or substantial modification of multiple Significant Trees associated with the Cheesman's Bush and Puhinui Gully bridge crossings. These trees include mature and old-growth indigenous canopy species that contribute to ecosystem structure, habitat availability, seed production, microclimate regulation, and ecological connectivity. While design refinements have avoided some of the most significant individual trees, permanent loss of some trees and substantial modification of others will occur to facilitate bridge construction and ongoing vegetation maintenance requirements.
Planted, mixed or modified woody vegetation PL.1, PL.2, PL.3, TL.2 and EF.1	Low	Low	Very low	The Project will result in the permanent loss or substantial modification of approximately 0.236 ha of native-dominated planted, mixed treeland and exotic forest with native understorey habitats. While these habitats contribute to local connectivity, buffering and fauna habitat, they are generally modified, relatively common within the wider landscape, and more readily replaced through restoration planting than remnant WF9 forest or VS5 scrub.
TL.3 exotic-dominated treeland, ES exotic scrub, EG exotic grassland, amenity grass, road corridor and built surfaces	Negligible	Negligible	Very low	These habitats are modified and generally have lower botanical value. Effects are relevant mainly because they provide lizard habitat, buffering and some fauna habitat. In vegetation terms, the magnitude is low or negligible depending on the habitat affected.

5.6.1.1 *Threatened and at-risk flora*

The magnitude of residual effects on threatened and at-risk flora is summarised in Table 5-4.

Table 5-4: Magnitude of residual effects on threatened and at-risk flora

Species	Ecological value	Magnitude of residual effect	Level of Ecological Effect	Assessment
King fern	High	Low to Moderate	Low-Moderate	One individual is confirmed within the Project footprint at Cheesman's Bush, and further plants may be present in suitable habitat. If the confirmed plant can be avoided and protected, residual effects are likely Low. If translocation is required, a Moderate magnitude may be appropriate because success is less certain and the species is tied to moist shaded habitat.
Carmine & white rātā	High	Low	Low	Carmine & white rātā is assumed present based on historical or previous survey records. Pre-clearance survey and salvage / avoidance should reduce the likelihood of loss. The residual effect is likely Low, subject to updated survey findings.

5.6.2 Bats

I consider that the magnitude of impact on the habitat for bats, given the lack of presence of this species to be negligible. The magnitude of residual effects on bats is summarised in Table 5-5.

I assess that the magnitude of effect on long-tailed bats with the implementation of survey and vegetation clearance protocols if they are found to be present prior to works to be negligible. This combined with a very-high ecological value for this species results in a **Negligible** level of ecological effect.

I do not consider that there are any residual effects on bats that require specific management however I have recommended a survey be carried out within 12 months of works being undertaken to ensure that bats are not present within the vegetation cleared (Section 5.5)

Table 5-5: Magnitude of residual effects on bats habitats.

Habitat type	Bat habitat value	Magnitude of residual effect	Level of Ecological Effect
WF9 taraire, tawa, podocarp forest	Low	Negligible	Negligible
VS5 broadleaved species scrub / forest	Low		
EF.1 exotic forest with native understorey; TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland	Low		
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Low		
ES exotic scrub, EG exotic grassland, open space, road corridor and hardstand	Negligible		

5.6.3 Avifauna

The magnitude of residual effects and level of ecological effects on avifauna species are summarised in Table 5-6 and habitats in Table 5-7 below.

Within Table 5-6 I provide commentary of the likely impact of habitat loss for each species, in Table 5-7 I use the highest magnitude of residual effect for any species (Low) to assess the residual level of effect of avifauna habitat loss.

I do not consider that there are any residual effects on avifauna that require specific management.

Table 5-6: Magnitude of residual effects on avifauna and their habitats.

Species	Ecological value	Magnitude of residual effect	Level of Ecological Effect	Basis for assessment
Long-tailed cuckoo / koekoeā	Very High	Negligible	Low	These species are likely absent, transient, or occasional users of the Project footprint. Nesting is unlikely for long-tailed cuckoo and kārearea, and pipit habitat is limited to open areas. With nesting bird protocols, the residual effect is expected to be Negligible.
Kārearea / bush falcon	Very High	Negligible	Low	
New Zealand pipit	High	Negligible	Very low	
Kākā	Moderate	Negligible	Low	Kākā may use the remnants seasonally or as stepping-stone habitat, but are unlikely to be resident. Habitat loss is small relative to the likely movement range of the species. Residual effects are expected to be Negligible.
Kererū	Moderate	Low	Low	Tūī and kererū are likely to use affected forest and planted habitat. The Project will remove some foraging and potential nesting habitat, but both species are mobile and widespread. The ecological function they provide is relevant, but a Moderate magnitude is not considered justified unless a substantial local loss of food resources or nesting habitat is demonstrated.
Tūī	Moderate	Low	Low	

Table 5-7: Magnitude of residual effects on avifauna habitats.

Habitat type	Ecological value	Magnitude of residual effect	Level of Ecological Effect
WF9 taraire, tawa, podocarp forest	High	Low	Low
VS5 broadleaved species scrub / forest	Moderate		
EF.1 exotic forest with native understorey; TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland	Low-Moderate		
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Low-Moderate		
ES exotic scrub	Low		Very low
EG exotic grassland and open space grassland	Low		
Road corridor, hardstand and built surfaces	Negligible		

5.6.4 Herpetofauna

The magnitude of residual effects and level of ecological effects on herpetofauna species are summarised in Table 5-6 and habitats in Table 5-7 below.

Within Table 5-6 I provide commentary of the likely impact of habitat loss for each species, in Table 5-7 I use the highest magnitude of residual effect for any species (Moderate) to assess the residual level of effect of herpetofauna habitat loss.

Table 5-8: Magnitude of residual effects on herpetofauna and their habitats.

Species	Ecological value	Magnitude of residual effect	Level of Ecological Effect	
Copper skink	High	Moderate	Moderate	Copper skink is confirmed present and the Project will remove suitable habitat within and outside SEAs. Salvage and relocation reduce mortality risk but do not fully address uncertainty or loss of established habitat. Replacement habitat will assist over time, but there will be a lag before it provides equivalent function.
Ornate skink	High	Moderate	Moderate	These species are not confirmed but are assumed potentially present in suitable habitat. Effects include habitat loss and risk of injury or mortality during clearance. Salvage effectiveness is uncertain, particularly for arboreal or cryptic species. A Moderate magnitude is appropriate on a precautionary basis.
Forest gecko	High			
Elegant gecko	High			
Pacific gecko	High			

Table 5-9: Magnitude of residual effects on herpetofauna habitats.

Habitat type	Herpetofauna habitat value	Magnitude of residual effect	Level of Ecological Effect
WF9 taraire, tawa, podocarp forest	High	Moderate	High
VS5 broadleaved species scrub / forest	Moderate-High	Moderate	High
TL.2 mixed native and exotic treeland; TL.3 exotic dominated treeland; EF.1 exotic forest with native understorey	Low-Moderate	Moderate	Moderate
PL.1, PL.2 and PL.3 planted native, mixed and amenity vegetation	Low-Moderate	Moderate	Moderate
ES exotic scrub	Moderate	Moderate	Moderate
EG exotic grassland and open space grassland	Negligible	Moderate	Very Low

Habitat type	Herpetofauna habitat value	Magnitude of residual effect	Level of Ecological Effect
Road corridor, hardstand and built surfaces	Negligible	Moderate	Very low

6 RESIDUAL EFFECTS MANAGEMENT

6.1 Overview

The effects assessment identifies residual adverse effects on several terrestrial ecological values after the application of avoidance, minimisation and remediation measures. The residual effects are:

- loss and modification of WF9 taraire, tawa, podocarp forest;
- loss and modification of VS5 broadleaved scrub / forest;
- potential loss or impact on king fern;
- loss or modification of Significant Trees;
- loss of confirmed and potential native lizard habitat; and
- effects of uncertainty associated with lizard salvage and relocation.

The residual effects management package is therefore focused on restoring and enhancing indigenous forest habitat, replacing and enhancing lizard habitat, improving ecological connectivity, managing pest plants and pest animals, and monitoring outcomes. These measures are intended to provide ecological gains that respond to the values affected by the Project.

6.2 Residual effects management package

The proposed residual effects management package includes the following core components:

- ecological restoration planting of native vegetation within the designation between Cheesman's Bush and Puhinui Gully, and a smaller area of planting within Totora Park;
  - approximately 10.36 ha of this planting will be designed and implemented with the intention to establish forest in the long term that contains the structure and vegetation composition of WF9 forest. Phased establishment and enrichment planting to guide restored areas toward WF9 forest structure and composition;
  - approximately 5.18 ha of the planting will be planted as above with the intention to create WF9 forest but will also include specific components for habitat creation or enhancement to address the permanent loss of lizard habitat;
- 1.05 ha of WF9 restoration and planting associated with the existing non-SEA WF9 fragment present at 134 Mill Road.
- the remaining planting (4.15 ha) of riparian and wetland vegetation is largely contiguous with this rest of the planting and restoration and will enhance habitat diversity and connectivity.
- Enhancement planting, pest plant and animal control and monitoring within the proposed designation in the extent of Cheesman's Bush (SEA_T_9102) (3.66 ha), Puhinui Gully (SEA_T_4570) (3.26 ha) SEAs, and the non-SEA WF9 vegetation within 134 Mill Road and areas of restoration planting proposed within this assessment;
- biodiversity outcome monitoring to assess establishment, habitat quality and ecological performance.

These restoration areas are illustrated within the mapping provided in APPENDIX E and a summary of the areas is provided in Table 6-1 below.

The purpose of the package is to provide ecological benefits that correspond to the values affected by the Project. The package is not limited to replacing area. It also addresses condition, habitat function, connectivity, pest pressure, and the establishment of future forest structure.

Table 6-1: Summary of the areas and types of restoration responses.

Restoration areas	Restoration responses	Area (ha)	Included in the BCM model? (Section 6.6)
Ecological Restoration – A - planting	Planting, pest control, enrichment planting.	5.29	Yes
Ecological Restoration – B – planting		5.07	Yes
Ecological Restoration – B - 143 Mill Road restoration		1.05	Yes
Ecological Restoration – Lizard Habitat Mix		5.18	Yes
Riparian Mix - planting		3.41	No
Wetland Mix - planting		0.74	No
Cheesman's Bush (SEA_T_9102)	Pest plant and animal control and enrichment planting	3.66	Yes
Puhinui Gully (SEA_T_4570)	Pest plant and animal control and enrichment planting	3.26	Yes
Total area under management		27.66	

6.3 WF9 restoration planting

The primary terrestrial residual effects management action is the restoration planting of approximately 16.59 ha of WF9 forest around and between Cheesman's Bush and Puhinui Gully. This planting will use available land within the designation to create a larger and more connected indigenous forest network between the two key affected remnants.

The restoration planting will be implemented in phases. Initial establishment planting will use species suited to exposed conditions, higher light, lower soil moisture and early successional environments. These species will stabilise soils, suppress exotic grasses and weeds, and create conditions suitable for secondary and later-successional species. Enrichment planting will then introduce species more typical of developing WF9 forest, including shade-tolerant and longer-lived canopy and subcanopy species.

The restoration planting will not replace mature WF9 forest in the short term. It will, however, provide additional indigenous habitat, improve buffering around retained forest, reduce isolation between remnants, and establish a future trajectory toward WF9 forest values. The ecological benefit of this planting is therefore strongest in relation to connectivity, buffering, future habitat development and long-term forest restoration.

6.3.1 Restoration planting requirements

The HREP should set out the location, staging and specification for all WF9 restoration planting. Planting areas should be mapped and should distinguish between restoration planting, rehabilitation planting, lizard habitat enhancement, enrichment planting and general landscape planting. Only planting that is designed, maintained and monitored for ecological outcomes should be counted toward terrestrial residual effects management.

The planting specification should include site preparation, releasing requirements from pasture or weed cover, plant species, plant grades, planting densities, spacing, eco-sourcing expectations, mulch or plant protection requirements where needed, replacement planting, maintenance, pest plant control and performance monitoring. Planting should be designed to establish a closed native canopy as early as practicable, while also providing a pathway toward a more diverse WF9 forest composition over time.

Performance standards should include minimum plant survival, weed cover, canopy closure trajectory, replacement planting requirements and monitoring duration. Where monitoring shows that restoration areas are not tracking toward the intended outcome, the plan should require remedial actions such as infill planting, additional weed control, pest animal control, or revision of the planting palette.

6.3.2 Lizard habitat replacement and enhancement

All of the planting and restoration identified above in Table 6-1 will benefit skinks and geckos. However the5.18 ha identified as “Ecological Restoration - Lizard Habitat Mix” will have specific lizard habitat features designed into the planting and features added to improve the physical habitat attributes provide by the plantings.

I consider copper skink habitat is best created by the dense planting of native vegetation that creates cool, damp, deep leaf litter, that includes habitat features such as rotten logs preferred by copper skinks. One key aim is that the interstitial spaces of the features added to plantings should be as small as possible, so the habitats provide refugia from pests such as rodents in the long term. Planting complex shrubs (e.g. divaricate species) and taller canopy species will also provide arboreal species with additional refugia. This will be achieved by incorporating into the design of the planting area:

- Planted areas of dense low vegetation and rank grass / shrubland interfaces;
- logs, root plates, coarse woody debris, rock or other retreat structures;
- sunny basking areas adjacent to dense cover; and
- refuges with stable humidity and temperature.

6.4 Pest plant and pest animal control

Pest plant and pest animal control are important components of the residual effects package because existing pest pressure is already affecting forest condition, regeneration and fauna habitat quality.

Pest plant control will focus on the restoration areas, rehabilitation areas, affected SEA edges, and retained indigenous vegetation, identified in Table 6-1 and mapped within Appendix E, where weed invasion may increase as a result of disturbance. Priority weeds include *Tradescantia*, woolly nightshade, privet, pampas, blackberry, ginger and other invasive species that suppress indigenous regeneration or alter forest-edge condition.

Pest animal control will be implemented for a 10-year management period. The programme should target the key predators and browsers affecting indigenous fauna and forest regeneration, including rats, mice, mustelids, hedgehogs, possums and cats where practicable. Monitoring should be used to confirm whether target pest levels are being achieved and maintained. Where targets are not achieved, the management response should be adjusted.

Pest control is particularly important for lizard relocation and for restoration success and higher density and more intensive pest control will be targeted at the relocation areas. It also provides broader benefits to forest birds, invertebrates, seedling recruitment and long-term forest condition.

6.5 Monitoring and management

Monitoring is required to determine whether the management package is delivering the intended ecological outcomes. Monitoring should include establishment and survival of restoration planting, weed cover, pest animal indices, lizard release habitat condition, lizard monitoring results, threatened flora survival or condition, and the condition of retained or rehabilitated habitat areas. These monitoring requirements will apply for the proposed 10 years of implementation.

The monitoring programme will need to include clear triggers for remedial action, and these will need to be included within the management plans. Examples include failure to achieve plant survival targets, persistent weed cover above specified thresholds, pest animal monitoring results above target levels, failed threatened flora translocation, poor lizard habitat condition, or evidence that salvaged habitat features are not being retained or maintained. Remedial actions should be implemented promptly and reported through the ecological management reporting process.

Annual reporting will summarise works completed, monitoring results, compliance with performance standards, any modifications to the management plans, outstanding risks and recommendations for the following year. At the end of the 10-year management period, a close-out report should confirm whether the ecological outcomes required by the management plans have been achieved or whether further remedial work or alternative effects management approaches are required.

6.6 Biodiversity compensation assessment

Offset and compensation are both used to address residual adverse effects. A biodiversity offset should aim to achieve a measurable conservation outcome that meets the offset requirements in Appendix 3 of the NPS-IB. It should aim to address more than minor residual effects by achieving Net Gain, demonstrated through a like-for-like quantitative loss/gain calculation so that the biodiversity values lost are fully accounted for.

Biodiversity compensation applies where residual adverse effects are addressed through positive conservation actions that meet the compensation requirements in Appendix 4 of the NPS-IB. Unlike an offset, compensation does not require a like-for-like quantitative loss/gain calculation. The relevant test is whether the proposed positive effects demonstrably outweigh the residual adverse effects.

Using the effects management hierarchy, biodiversity offsetting was considered first for all residual adverse effects assessed as Moderate or higher, after avoidance, minimisation and remediation measures had been applied.

Offsetting was not considered feasible for most affected ecological values. This was primarily because there was insufficient knowledge of species distribution, or because the surveys, management interventions and measurable outcomes needed to support a defensible offset model were not technically feasible.

The only metric for which offsetting could be quantitatively modelled from collected data is basal tree area for native trees greater than 15 cm DBH. However, basal area is of limited value as an offset currency for the affected mature forest values in this case. Basal area does not adequately capture the diversity, ecological function, structural complexity, age, habitat attributes, of mature and old-growth forest. This limitation is particularly important where planting is proposed as the offset action, because planting can rapidly generate a high density of woody stems and basal area, but does not replicate the ecological values associated with mature forest within the relevant timeframe. On that basis, I consider a Biodiversity

Offset and Accounting Model (BOAM) using this metric as a proxy for ecological value would not have demonstrated a defensible biodiversity offset.

Due to the limitations of offsetting in the ecosystems impacted, a Biodiversity Compensation Model (BCM) has been used to assess the degree to which the residual effects management package compensates for the residual adverse effects on terrestrial ecological values. The full details of the model are provided in APPENDIX K. An assessment against the Compensation Principles contained within the National Policy Statement for Indigenous Biodiversity (NPSIB) (Ministry for the Environment, 2023) has been provided in APPENDIX L.

Due to the sensitivity of the ecosystems impacted I have carried out this modelling using a very conservative approach. For example, I have modelled the impacts and benefits in the following way:

- The model assumes total loss for directly impacted and permanently lost vegetation (Section 5.4.1) and vegetation that is modified as part of the construction and maintenance of the bridges (Section 5.4.2). In reality the areas modified will continue to provide habitat and maintain a level of ecological value (albeit reduced from baseline but not total loss).
- For impact risk contingency the model uses a very high risk multiplier (increases the scale of quantified effect by 20%) for impacts on WF9 forest and high risk for all other vegetation/habitat (increase the scale of quantified effect by 10%)
- For impact uncertainly a high uncertainty multiplier (increases the quantified scale of effect by 20%) is used for all impacts on WF9 and VS5 vegetation. Uncertainty is primarily relevant to WF9 and VS5 vegetation as these effects are associated with the bridges. While I have assumed total loss for all vegetation, the extent of impact due to changes in the environment around the bridges may be of a greater extent (however, I consider it is highly unlikely the extent of impact is 20% greater than the conservatively assumed total loss figure). The rest of the vegetation a low uncertainty multiplier is used (increases the quantified scale of effect by 10%)
- For the confidence in compensation actions, I have universally applied a moderate confidence in the success of the proposed actions. This multiplies the benefits of the compensation actions by 0.625 (which reduces the quantified benefits of the compensation actions by 37.5%).
- I have not accounted for the benefits of pest animal control (which is proposed to occur for 10 years) in any of the compensation actions associated with 134 Mill Road, or the restoration and enhancement planting at Cheesman's bush (SEA_T_9102) and Puhinui Gully (SEA_T_4570). Instead, I have assessed a small increase (0.1/5) from baseline to represent a reduction of pest plant pressure and benefits to long-term regeneration succession of these actions only.
- The value score after compensation for planting activities is stated to be 1/5 after ten years. This is half the value used in the impact model for TL.2, PL.2, PL.3, EF.1 vegetation which is the closest comparable ecosystems I anticipate 10-year-old plantings as part of this package will achieve.
- I have not included the 4.15 ha of the proposed wetland and riparian vegetation within the model which is largely contiguous with the proposed WF9 planting and will provide for increased connectivity, habitat heterogeneity, and buffering.

As such with the assumption of total loss of vegetation and habitat, and the approach I have taken in the model has considerably increased the quantification of the severity of the effects and conversely considerably decreased the quantification of the potential benefits of the compensation benefits. With this approach taken I have modelled that the proposed package provides for a 36.6% positive benefit to the ecosystems affected.

6.7 Residual effects management conclusion

The proposed residual effects management package has been developed recognising that the Project will result in permanent loss and modification of indigenous vegetation, including mature WF9 forest, VS5 scrub/forest, and associated significant trees. While restoration planting, habitat enhancement, pest plant

control, pest animal control, and lizard habitat enhancement can provide substantial ecological gains over time, they do not immediately replace the attributes of the mature ecosystems being affected.

The Biodiversity Compensation Model indicates that the proposed package results in a net positive outcome, with compensation benefits exceeding quantified residual losses by approximately 36.6%. This outcome should not be interpreted as meaning the affected mature forest ecosystems have been fully replaced. Mature WF9 forest contains ecological attributes that develop over many decades or centuries, including large canopy trees, complex vertical structure, specialised microclimates, coarse woody debris, epiphyte communities, extensive root systems, and habitat features associated with old-growth conditions. These attributes cannot realistically be recreated within the short to medium term through restoration planting or habitat enhancement alone.

The degree of apparent over-compensation generated by the model is therefore considered appropriate and necessary. A substantial surplus is required because newly established vegetation provides only a subset of the ecological function, resilience, structural complexity, and habitat values of the mature vegetation being lost. The modelling also incorporates deliberately conservative assumptions that increase the quantified scale of effects and reduce the quantified value of compensation outcomes. These include treating modified vegetation beneath and adjacent to bridges as a total loss, applying elevated risk and uncertainty multipliers to impacts, discounting compensation benefits through moderate confidence factors, assigning low value scores to restoration planting after ten years, and excluding several ecological benefits from the compensation calculations. As a result, the model is intentionally biased towards underestimating gains and overestimating losses.

The compensation assessment is conservative because it does not fully capture several ecological benefits expected to arise from the wider residual effects management package which have not been relied upon to demonstrate compensation adequacy. These include improvements in habitat condition resulting from pest animal control, retention of vegetation and habitat beneath bridge structures, retention of coarse woody debris and habitat features associated with topped or modified trees, enhanced buffering of remnant vegetation, and improved ecological connectivity associated with landscape planting proposed as part of the landscape design. The assessment also excludes the proposed 4.15 ha of wetland and riparian restoration planting that will be established largely contiguous with the proposed WF9 restoration planting areas.

Although not included within the biodiversity compensation calculations, these additional positive benefits and restoration areas will increase habitat heterogeneity and structural diversity, strengthen riparian ecological functions, improve connectivity between indigenous habitat patches, provide additional buffering of remnant vegetation, and enhance the long-term resilience of the wider ecological network. While these benefits are difficult to quantify within the compensation model, they are expected to contribute positively to long-term ecological outcomes, meaning the ecological benefits ultimately achieved by the Project are likely to exceed those reflected in the modelled compensation surplus.

Accordingly, it is my opinion that the proposed residual effects management package is ecologically appropriate and proportionate to the scale and nature of the residual effects. The modelled compensation includes appropriate multipliers to address uncertainty, time lags, and the irreplaceability of mature indigenous forest attributes and the modelled positive surplus provides for an even greater account for any other potential source of uncertainty. While the immediate loss of mature forest values cannot be fully compensated in the short term, the combination of restoration, enhancement, and management is expected to deliver a positive outcome for terrestrial ecological values within the Project area within a 10-year timeframe.

7 CONCLUSION

The Project will result in unavoidable adverse effects on terrestrial ecological values, particularly through the loss and modification of WF9 taraire, tawa, podocarp forest, VS5 broadleaved scrub / forest, Significant Trees, and confirmed or potential native lizard habitat. These effects are on mature and regenerating indigenous forest remnants, including ecological attributes that cannot be replaced in the short or medium term.

The Project design and proposed construction methods have reduced effects where practicable, including through bridge design refinements, reduced vegetation clearance, targeted fauna and flora management, and controls on construction-related effects. However, residual adverse effects remain and require compensation through restoration, enhancement and long-term ecological management.

The proposed residual effects management package is ecologically appropriate to the nature and scale of those residual effects. It includes WF9 restoration planting, lizard habitat replacement and enhancement, enhancement of retained forest remnants, pest plant and pest animal control, threatened plant management, habitat feature salvage, and monitoring. In total, 27.66 ha is proposed to be under ecological management.

The Biodiversity Compensation Model indicates that the benefits of the proposed effects management package exceed quantified residual losses by approximately 36.6%. This surplus is appropriate given the time lag, uncertainty and partial functional replacement associated with compensating for mature forest values and established fauna habitat.

The proposed package is considered sufficient to manage the residual terrestrial ecological effects of the Project. While the loss and modification of mature forest values cannot be fully replaced within the assessment period, the combination of avoidance, minimisation, targeted management, restoration planting, habitat enhancement and long-term monitoring is expected to deliver a positive modelled outcome for the affected terrestrial ecosystems.

8 REFERENCES

Acevedo-Charry, O., & Aide, T. M. (2019). Recovery of amphibian, reptile, bird and mammal diversity during secondary forest succession in the tropics. *Oikos*, *128*(8), 1065–1078.

Anderson, P., Bell, T., Chapman, S., & Corbett, K. (2012). *New Zealand lizards conservation toolkit: A resource of conservation management of the lizards of New Zealand*. Society for Research on Amphibians and Reptiles of New Zealand.

Baber, M., Christensen, M., Quinn, J., Markham, J., Kessels, G., Ussher, G., & Signal Ross, R. (2021). The use of modelling for terrestrial biodiversity offsets and compensation: A suggested way forward. *Resource Management Journal*, *April 2021*, 28–33.

Baber, M., Dickson, J., Quinn, J., Markham, J., Ussher, G., Heggie-Gracie, S., & Jackson, S. (2021). *A Biodiversity Compensation Model for New Zealand: A user guide (Version 1)* (Project Number 1017287.0000P.v1). Tonkin & Taylor Ltd.

Bat Recovery Group - Department of Conservation. (2024). *Protocols for minimising the risk of felling occupied bat roosts (Bat roost protocols): Version 4*. Bat Recovery Group - Department of Conservation.

Boffa Miskell Ltd. (2014). *Mill Road Corridor Notice of Requirement: Assessment of ecological effects*. Prepared by Boffa Miskell Ltd for Auckland Transport.

Bredin, I. (2025). *Te Ara Hauāuru Northwest Rapid Transit: Assessment of ecological effects*. Prepared by AECOM for NZ Transport Agency Waka Kotahi. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0018/20574/NWRT_Part-6_15_Assessment-of-Ecological-Effects.pdf

de Lange, P. J., Gosden, J., Courtney, S. P., Fergus, A. J., Barkla, J. W., Beadel, S. M., Champion, P. D., Hindmarsh-Walls, R., Makan, T., & Michel, P. (2024). *Conservation status of vascular plants in Aotearoa New Zealand, 2023* (New Zealand Threat Classification Series No. 43). Department of Conservation. https://www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs43entire.pdf

Department of Conservation. (2012). *Inventory and Monitoring Toolbox: Herpetofauna*. Department of Conservation.

EIANZ. (2018). Ecological impact assessment (EcIA): EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems. 2nd EDITION. Environment Institute of Australia and New Zealand.

Hitchmough, R. A., Barr, B., Knox, C., Lettink, M., Monks, J. M., Patterson, G. B., Reardon, J. T., Van Winkel, D., Rolfe, J., & Michel, P. (2026). *Conservation status of New Zealand reptiles, 2025* (New Zealand Threat Classification Series No. 50). Department of Conservation.

Hurst, J. M., Allen, R. B., & Fergus, A. J. (2022). *The RECCE method for describing New Zealand vegetation: Expanded manual: Version 5* (Landcare Research Contract Report No. LC4102). Prepared by Manaaki Whenua Landcare Research for the Department of Conservation.

Kessels & Associates Ltd. (2008). *Mill Road Corridor Study: Assessment of ecological effects*. Prepared by Kessels & Associates Ltd for Manukau City Council.

Maseyk, F. J. F., Ussher, G. T., Kessels, G., Christensen, M., & Brown, M. (2018). *Biodiversity offsetting under the Resource Management Act: A guidance document*. Prepared for the Biodiversity Working Group on behalf of the BioManagers Group.

McEwen, W. M. (Ed.). (1987). *Ecological regions and districts of New Zealand* (3rd rev. ed. in four 1:500 000 maps). Department of Conservation.

Ministry for the Environment. (2023). *National policy statement for indigenous biodiversity*. Ministry for the Environment. https://environment.govt.nz/assets/publications/biodiversity/National-Policy-Statement-for-Indigenous-Biodiversity.pdf

New Zealand Transport Agency. (2021). Mill Road NZUP summary report: Ecological factual report (Version 1).

O'Donnell, C. F. J., Borkin, K. M., Christie, J. E., Davidson-Watts, I., Dennis, G., Pryde, M. A., & Michel, P. (2023). *Conservation status of bats in Aotearoa New Zealand, 2022* (New Zealand Threat Classification Series No. 41). Department of Conservation.

Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N., Makan, T. D., Miskelly, C. M., Sagar, P. M., Scofield, R. P., Taylor, G. A., & Michel, P. (2021). *Conservation status of birds in Aotearoa New Zealand, 2021* (New Zealand Threat Classification Series No. 36). Department of Conservation.

Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). *Ecological impact assessment (EcIA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems* (2nd ed.). Environment Institute of Australia and New Zealand.

Simcock, R. C., Innes, J., Samarasinghe, O., Lambie, S., Peterson, P., Glen, A., & Faville, N. (2022). Road edge-effects on ecosystems: A review of international and New Zealand literature, an assessment method for New Zealand roads, and recommended actions (Waka Kotahi NZ Transport Agency Research Report No. 692). Prepared by Landcare Research for Waka Kotahi NZ Transport Agency.

Simpkins, E., Woolly, J., De Lange, P., Kilgour, C., Cameron, E. K., & Melzer, S. (2025). *Conservation status of vascular plant species in Tāmaki Makaurau / Auckland* (Auckland Council Technical Report No. 2025/6). Auckland Council. https://www.knowledgeauckland.org.nz/publications/conservation-status-of-vascular-plant-species-in-tamaki-makaurau-auckland-revised-march-2025-species-list/

Singers, N. J. D., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J., Hill, K., Andrews, J., Hill, S., & Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council.

Singers, N. J. D., & Rogers, G. M. (2014). *A classification of New Zealand's terrestrial ecosystems* (Science for Conservation No. 325). Department of Conservation.

Van Winkel, D., Baling, M., & Hitchmough, R. A. (2018). *Reptiles and amphibians of New Zealand: A field guide*. Auckland University Press.

Woolly, J., Lovegrove, T., Robertson, H., Dell'Ariccia, G., & Melzer, S. (2024). *Conservation status of birds in Tāmaki Makaurau* (Auckland Council Technical Report No. 2024/5). Auckland Council. https://www.knowledgeauckland.org.nz/publications/conservation-status-of-birds-in-tamaki-makaurau-auckland/

9 APPENDICES

APPENDIX A Statement of Experience and Qualifications and Code of Conduct

My name is Andrew Russell Blayney. I am a senior terrestrial ecologist (Senior Principal) at Boffa Miskell Limited, based in Hamilton. I have held this role since January 2017. I hold the qualifications of Master of Science – Zoology (1st class Honours), Massey University (2013) and Bachelor of Science - Ecology & Zoology, Massey University (2010). I am also a Certified Environmental Practitioner (Certification # 1278) under the Certified Environmental Practitioner Scheme of the Environmental Institute of Australia and New Zealand, and I am bound by the Institute's code of ethics.

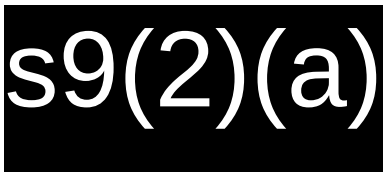
I have listed a selection of projects I have worked on to highlight my experience which is relevant to my Ecological Effects Assessment:

- **Te Ara Hauāuru Northwest Rapid Transit (2026 – present) -** Lead terrestrial vegetation ecologist for the fast-track consenting process for a rapid transit busway in the Auckland area.
- **Tauriko West – Tupenga (2026 – present) –** Lead terrestrial technical reviewer and wetland ecologist for fast track consenting process for upgrades to SH29.
- **Takitimu North Link Stage 2 (2020 – present):** Lead terrestrial ecologist for the fast-track consenting process for a four-lane highway between Te Puna and Ōmokoroa. Co-author of the Ecological Effects Assessment for the project, covering terrestrial ecology, wetlands, bats, lizards, and broader biodiversity values. Provided expert witness evidence to the Expert Panel, addressing matters including wetland offset ratios, wetland restoration management, bat management, and lizard management. Involved in expert caucusing on ecological effects and mitigation requirements and contributed to refinement of ecological conditions within the Fast-track approvals process.
- **Whangārei to Te Hana IBC / DBC, (2017-2024):** Terrestrial ecologist (vegetation, wetlands, lizards, and bats) for initial and detailed business case. Carried out multi-criteria analyses on potential effects on ecological values arising from a range of long list and short list alignment options.
- **Rangiriri Solar Farm, Waerenga Solar Farm, Annies Way Solar Farm, and Morrinsville Solar Farm (2022-Present):** I am the lead project ecologist for the listed grid scale solar farms. This has involved devising assessment methods, providing technical input and review of the ecological assessments and development of the effects management strategies, responding to submissions, liaison with stakeholders, and post consent advice.
- **Cambridge Wastewater Treatment Plan – Cambridge (2021 – 2025):** Provided technical advice on ecological assessment matters regarding terrestrial and wetland matters for the project to consent the replacement of the Cambridge Wastewater Treatment Plant. Peer review for the final Ecological Impact Assessment. Responsible for the delivery of onsite terrestrial ecology works and development of the ecological components of the landscape and ecological management plan including wetland restoration.
- **Ruakura Inland Port, Hamilton (2017 - 2025):** Lead project ecologist in the design, consenting and implementation of multiple stages of the inland port development in the Ruakura Structure Plan area and associated supporting infrastructure. This includes the survey, assessment, and management of fauna, including long-tailed bats, providing ecological input into the development and design of wetlands and lizard habitat for mitigation, management plans for long-tail bat effects

management, and providing technical advice on ecological constraints and opportunities associated with the project.

- **Te Ahu Turanga: Manawatū Tararua Highway - Manawatū Gorge Replacement Project (2018 - 2020):** Carried out an assessment of terrestrial fauna values and effects for the project. Including surveys and habitat assessments for herpetofauna, bats, and birds. Presented expert witness evidence to District Court hearing.

Although this matter is not before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses as contained in section 9 of the Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I am satisfied that the matters which I address in this report are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.



Andrew Blayney
August 2026

APPENDIX B Arboricultural Assessment - Peers Brown Miller Ltd

TECHNICAL MEMORANDUM ARBORICULTURAL ASSESSMENT – MILL ROAD STAGE 1

PREPARED FOR:	New Zealand Transport Agency Waka Kotahi (**NZTA**)
PREPARED BY:	Matthew Paul
DATE:	August 2026

1.0 Introduction

This assessment has been prepared on behalf of the NZ Transport Agency Waka Kotahi **(NZTA)** to support a substantive application under the Fast-track Approvals Act 2024 **(FTAA)**. The purpose of this assessment is to identify the arboricultural values of, and the Project's impact on, trees within Significant Ecological Areas (**SEAs**), the area of vegetation at 134 Mill Road outside the SEA, and Tōtara Park. The trees addressed in this assessment are located in four areas as shown in **Figure 1** below:

a) Cheesman's Bush (both within and outside the SEA);
b) Puhinui Gully / Watercare Bush;
c) Everglade Reserve, Kingsclere Place Reserve and Goodwood Drive; and
d) Tōtara Park.

This assessment does not assess the effects of the Project on Mana Whenua cultural values associated with the trees subject to this assessment. However, Mana Whenua have shared these values with the Project Team through hui.

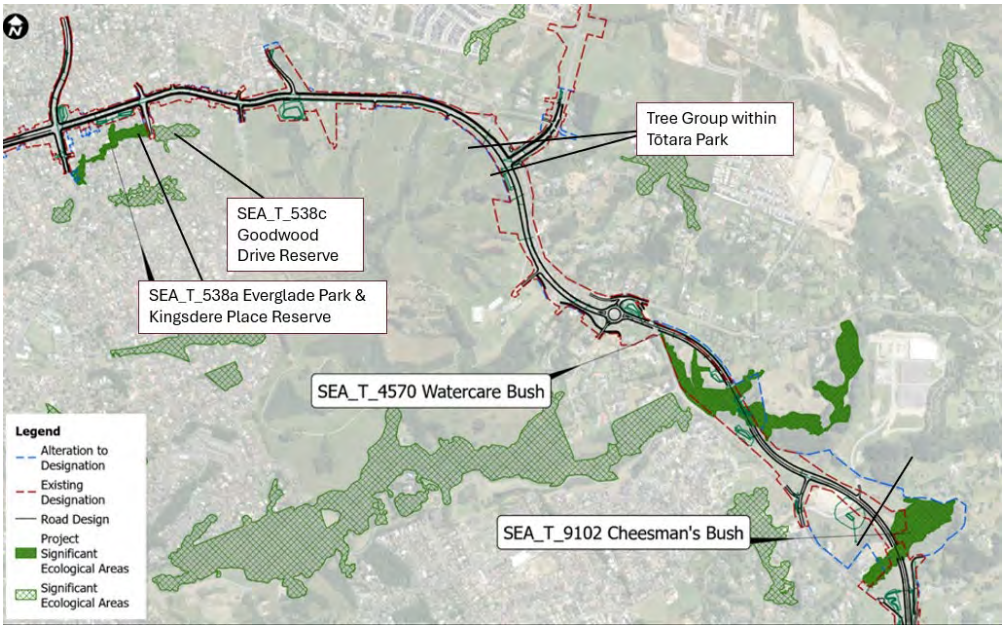


Figure 1 Location of areas covered by the Arboricultural Assessment (Note – areas shown in green fill are SEAs that are impacted by the Project, areas shown in green hatch are SEAs that are in close proximity to the Project)

2.0 Overview of assessment methodology

The assessment involved the following:

a) A desktop review of previous assessments and plans supporting the 2014 Notices of Requirement **(NoR)**, including the relevant design drawings and arboricultural and landscape assessments;

b) Site visits to the corridor on multiple occasions including in June, August, September and October 2025; and

c) An assessment of the trees within the areas shown in Figure 1. The assessed trees have been classified into the categories outlined in **Table 2-1**. The term '**Significant Trees**' is used in this assessment and includes the Old Growth, Large, Mature and the Specific Sub-mature Trees described in the table below. Trees that fall within the 'Other young and Sub-mature' category in the table below are not covered by this assessment.

Table 2-1: Tree maturity categories based on species-specific DBH thresholds

Classification	Description
Old growth / remnant	At full expected Diametre at Breast Height (**DBH**) or more (>130cm DBH)
Large	Trees that are close to full height, DBH, and crown size. Generally maximum DBH of 100-120 cm across species (81 – 130cm DBH range)
Mature	Generally, DBH of up to 80 cm, considered mature in age based on species type (51 – 80cm)
Specific Sub-mature trees	Trees 225, 226, 227, 229, 254, 255, 300, 335 and 345. These are specific trees of significance because they are within the SEA, contribute to the structural diversity and arboricultural value of the old growth forest, and will support long-term canopy replacement. These trees are below 50cm DBH.
Other young / Sub-mature	Other trees below 50cm DBH

3.0 Existing environment

Overall, the areas within the Project extent are representative of a modified environment dominated by residential or rural land use types, with indigenous forest fragments and tree groups predominantly present in the SEAs.

3.1 Cheesman's Bush

An SEA (SEA_T_9102) applies across parts of 134, 146 and 158 Mill Road and is referred to as the 'Cheesman's Bush SEA'. Areas of land across 134, 146 and 158 Mill Road that are not classified as SEAs are largely open grass land and have historically been grazed. There are some Significant Trees on the eastern boundary of 134 Mill Road which are not identified as SEA, however, this area is outside of the Project extent. The SEA extent and grazed areas are indicatively illustrated in **Figure 2** below.

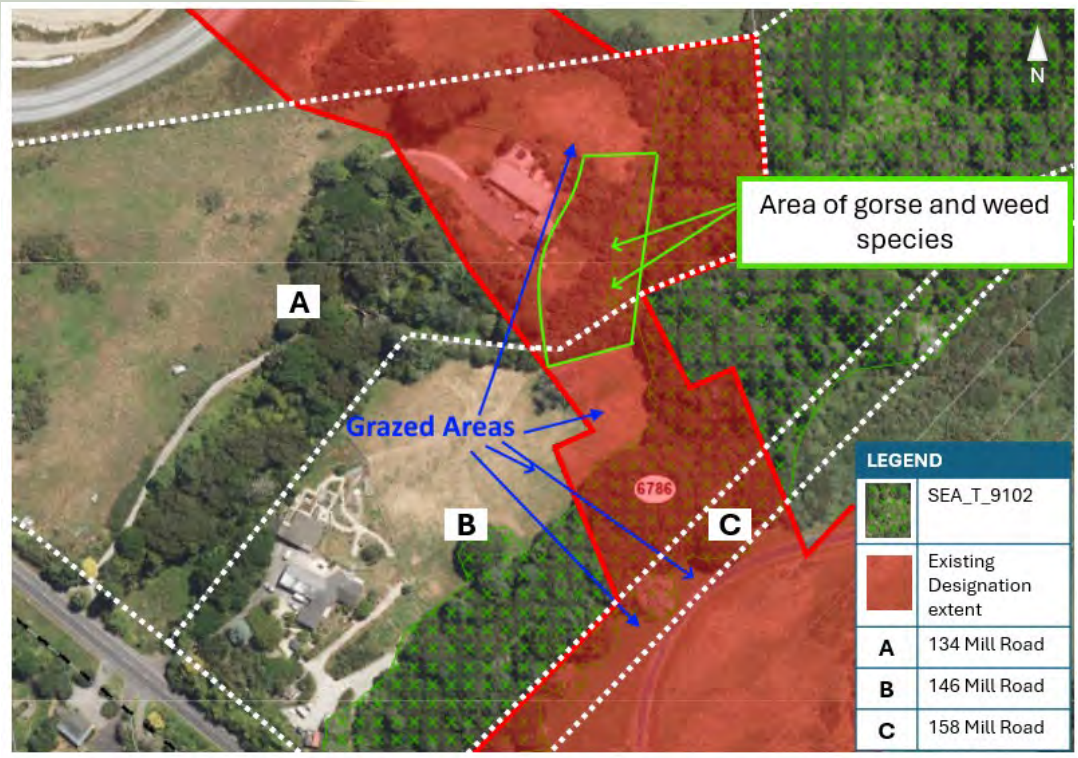


Figure 2 SEA extent and vegetation across 134, 146 and 158 Mill Road (Cheesman's Bush SEA)

The vegetation within the SEA at 146 Mill Road (noting the area of vegetation within 134 Milll Road that is not SEA and is discussed below) comprises mature indigenous forest (WF9 type) and contains a mixture of species such as puriri, taraire and kahikatea. Some of the trees of these species are 'old growth / remnant'. The vegetation also contains a dense understorey vegetation including species such as mahoe and emergent tawa. There are also numerous 'large' and 'mature' species such as kānuka, kahikatea, māhoe, taraire and kohekohe.

At 158 Mill Road, several large indigenous trees are growing within the grazed paddock within the SEA extent (see **Figure 2**), including an old growth puriri *(Vitex lucens)* identified as Tree 259 in the Old Growth Tree Management Plan (**OGTMP**) (see **Figure 3** below). As this tree stands within the grazed paddock, there is evidence of historic stock damage and erosion around the tree. This damage has been caused by stock movement directly in front of this tree that has occurred over time, between the stem of the tree and the farm fence.



Figure 3 Tree 259 growing within the formerly grazed area within 158 Mill Road

Vegetation within the SEA at 134 Mill Road contains WF9 forest types, consisting of a mixture of mature climax species such as puriri, taraire, and kahikatea. These trees are complemented by an understorey of species such as māhoe and emergent tawa. A large puriri tree is also recorded at this site adjacent to the mapped SEA extent (although this tree is not impacted by the Project).

3.2 38 Mill Road (Puhinui Gully/Watercare Bush)

The Puhinui Gully/Watercare Bush SEA (SEA_T_4570) is shown in **Figure 4** below and comprises:

a) A concentrated area of old growth and mature indigenous trees including rimu, tōtara, miro and kahikatea at the northern end of the impacted area; and

b) A mixture of pest plant species dominated by gorse and privet, with emergent species such as ponga, hangehange and māhoe further south of the bridge alignment.

Historically, these areas were extensively grazed, with this evident in sections of the bush with poor quality vegetation and damaged fencing. From an arboricultural perspective, the most intact area of the SEA that is of higher quality is located near to the existing Mill Road, away from the proposed bridge and road alignment.

The most significant large indigenous trees are located directly to the west of the proposed bridge structure. From an arboricultural perspective, the quality of vegetation intensifies further northwest nearer to the current Mill Road carriageway and nearer to the Puhinui Gully (to the southwest).

Areas to the northeast and south/southeast of the proposed bridge are of much lower quality, being the areas dominated by a mixture of pest species such as gorse and privet, with emergent indigenous species including māhoe and hangehange dominating the emerging canopy (refer to **Figure 4** and **Figure 6** below).

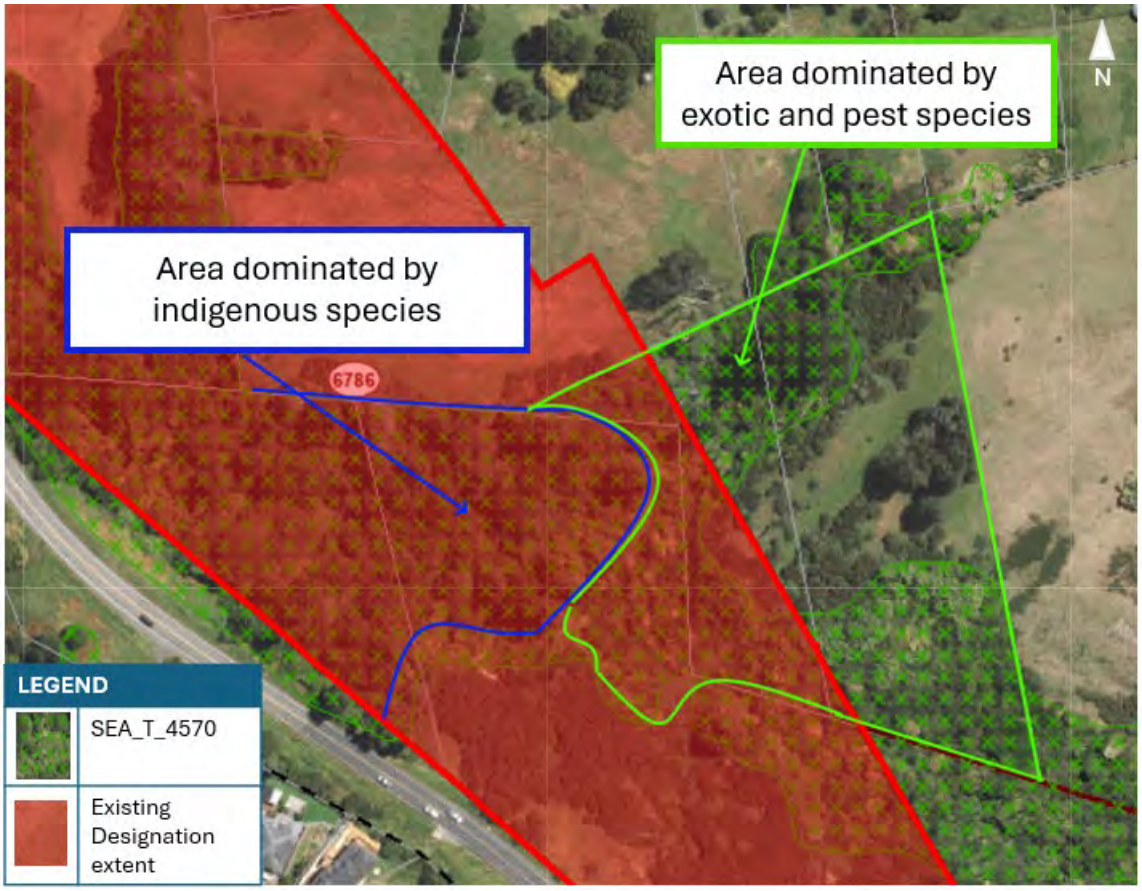


Figure 4 SEA extent and vegetation across 38 Mill Road (Puhinui Gully / Watercare Bush SEA)

Site investigations in 2025 discovered the presence of a farm track that crosses the SEA (refer to **Figure 5**) and a large culvert crossing the stream near the large tōtara *(Podocarpus totara)* identified as Tree 422 in the OGTMP (refer to **Figure 9**). The area near this tree is predominately gorse and weed species, with willow trees *(Salix sp.)* also historically lining the stream bank. Some willow trees currently remain in the area.



Figure 5 Image of historic photography from 2006 showing the farm track and indicative location of the farm culvert



Figure 6 Image of vegetation impacted by the proposed bridge on the northern side near the proposed abutment (note the lack of understorey vegetation due to historic grazing)

3.3 Everglade Reserve, Kingsclere Place Reserve, Goodwood Drive, Tōtara Park and 134 Mill Road.

The table below summarises the existing vegetation within the designation footprint at Tōtara Park, Everglade Reserve, Kingsclere Place Reserve, Goodwood Drive and 134 Mill Road (outside the SEA).

Table 3-1: Existing vegetation within the designation footprint at Tōtara Park, Everglade Reserve, Kingsclere Place Reserve, Goodwood Drive Drive and 134 Mill Road (outside the SEA)

Area	Summary of existing environment
Tōtara Park 	Two primary groups of vegetation / trees are within the Project extent referred to as Group 164 (opposite 228 Redoubt Road) and Group 166 (opposite 256 Redoubt Road). Group 164 comprises of planted indigenous vegetation dominated by regenerative species such as manuka, tī kōuka and kōwhai. The more significant indigenous climax species including a kahikatea stand are located further west (of Group 164) and is outside of the Project extent. Group 166 comprises of a mix of exotic and indigenous vegetation. These are largely self-sown indigenous species and mature exotic species dominated by macrocarpa.
Everglade Park (12R Everglade Drive), Kingsclere Place Reserve (13R Goodwood Drive) and Goodwood Drive Reserve (6R Goodwood Drive) 	There are three SEAs located across Everglade Park (SEA_T_538a), Kingsclere Place Reserve (SEA_T_538a) and Goodwood Drive Reserve (SEA_T_538c). The three SEA extents are connected and/or adjacent to each other, generally forming a corridor (see figure to the left). Vegetation within Everglade Park is a mixture of mature indigenous species dominated by tōtara and an area of pioneer/self-sown indigenous vegetation dominated by coprosma. Vegetation located within Kingsclere Place Reserve and Goodwood Drive Reserve overhangs existing hardstand within the road reserve. The vegetation includes two

	mature puriri trees and understorey vegetation including karaka and coprosma.
134 Mill Road 	The vegetation within Group 179 at 134 Mill Road (located west of the Cheesman's Bush SEA) contains a mixture of mature climax species such as puriri, taraire and kahikatea, complemented by an understorey of species such as māhoe and emergent tawa.

4.0 Assessment of Impacts on Trees

The SAR discusses the changes made to the design to avoid the potential impact of the Project on the SEAs and Trees in the first instance. Where avoidance of the effects was not practicable, further work was undertaken to refine the construction methodology to minimise the effects on Trees, as set out below.

4.1 Cheesman's Bush

Significant work has been undertaken to refine a construction and maintenance methodology that will minimise the impact on the Significant Trees within Cheesman's Bush. The Project Team started with a 10m buffer either side of the bridge which assumed that all vegetation under and either side of the bridge (within the buffer) would be removed to enable construction flexibility. Through working with the contractor, NZTA has been able to update the construction methodology as follows:

a) Cranes and associated bridge structure installation will be limited to the bridge abutment areas on either side of the bridge so that there is no machinery or prolonged pedestrian movement within Cheesman's Bush itself;

b) Only those Significant Trees that are either within the footprint of the bridge abutment areas will be removed;

c) The tree clearance methodologies to be used will be 'light touch' and use lifting equipment, rather than manual felling;

d) Ongoing pruning and topping of trees around the bridge will be limited to a maintenance area of 2 metres beneath the bridge deck and 5m either side of the bridge abutments; and

e) Shade emulating methods, such as the introduction of shade cloth and/or similar methodologies during construction, will be considered if practicable, to emulate existing low light conditions for understorey vegetation post tree pruning and topping works.

The construction of Cheesman's Bush bridge has the potential to impact a total of sixty (60) Significant Trees as shown in **Figure 7** below, summarised in **Table 4-1**, and set out in detail in Table 3 of the OGTMP.

Twelve (12) Significant Trees are located within the earthworks footprint for the bridge abutments and will need to be removed. The logs from the removed trees will be offered to Mana Whenua for repurposing in the first instance (refer to Part C of the SAR and the OGTMP).

A total of forty-eight (48) Significant Trees will need to be topped or trimmed to facilitate the installation of the bridge deck. The bridge deck will be craned in from the abutments on either side and will span the area (i.e. no support structures are required). This design will mean that while some of the taller trees will need to be trimmed, the remaining vegetation will remain undisturbed. Once installed, a 'Bridge Maintenance Area' will apply 2m beneath the bridge and 5m either side of the bridge within which trees will be trimmed to enable a clear envelope around the bridge structure for safety and maintenance reasons in the operational phase of the Project. No removal of understorey vegetation is required to enable ongoing maintenance and will remain intact.

Of the forty-eight (48) Significant Trees to be trimmed or topped:

- Twenty (20) Significant Trees have been assessed as likely to survive long term;
- It is uncertain whether twenty-one (21) Significant Trees will survive long term;
- Seven (7) Significant Trees are unlikely to survive due to the large extent of topping or trimming and/or the tolerance of the species to trimming (including taraire, kahikatea, māhoe, puriri, tawa and kohekohe species).

All cut material from trimmed and topped trees will, be left in insitu to provide habitat within the Project restoration areas, where practicable (i.e. material may be removed where a tree becomes stressed following trimming or topping and poses a risk to the safe operation of the road). It is also anticipated that over time, indigenous understorey regeneration will occur beneath the bridge and may stabilise as a lower-stature canopy. This outcome will be beneficial in the long term as it will provide long term vegetative cover of a lower-stature, meaning there will be less need for repeated heavy pruning. Pruning and trimming requirements are therefore likely to decrease over time.

The OGTMP sets out how topped or trimmed trees will be managed and requires that a suitably qualified and experienced Project Arborist (who holds a minimum Level 4 arboricultural qualification) oversees construction works within Cheesman's Bush.

Table 4-1 Summary of impacted Significant Trees within Cheesman's Bush

Tree impact activity	Significant Trees to be completely removed	Significant Trees to be topped and/or trimmed			Total potentially impacted Significant Trees
		Likely to survive	Survival uncertain	Survival unlikely	
Cheesman's Bridge and associated earthworks	12	20	21	7	**60**

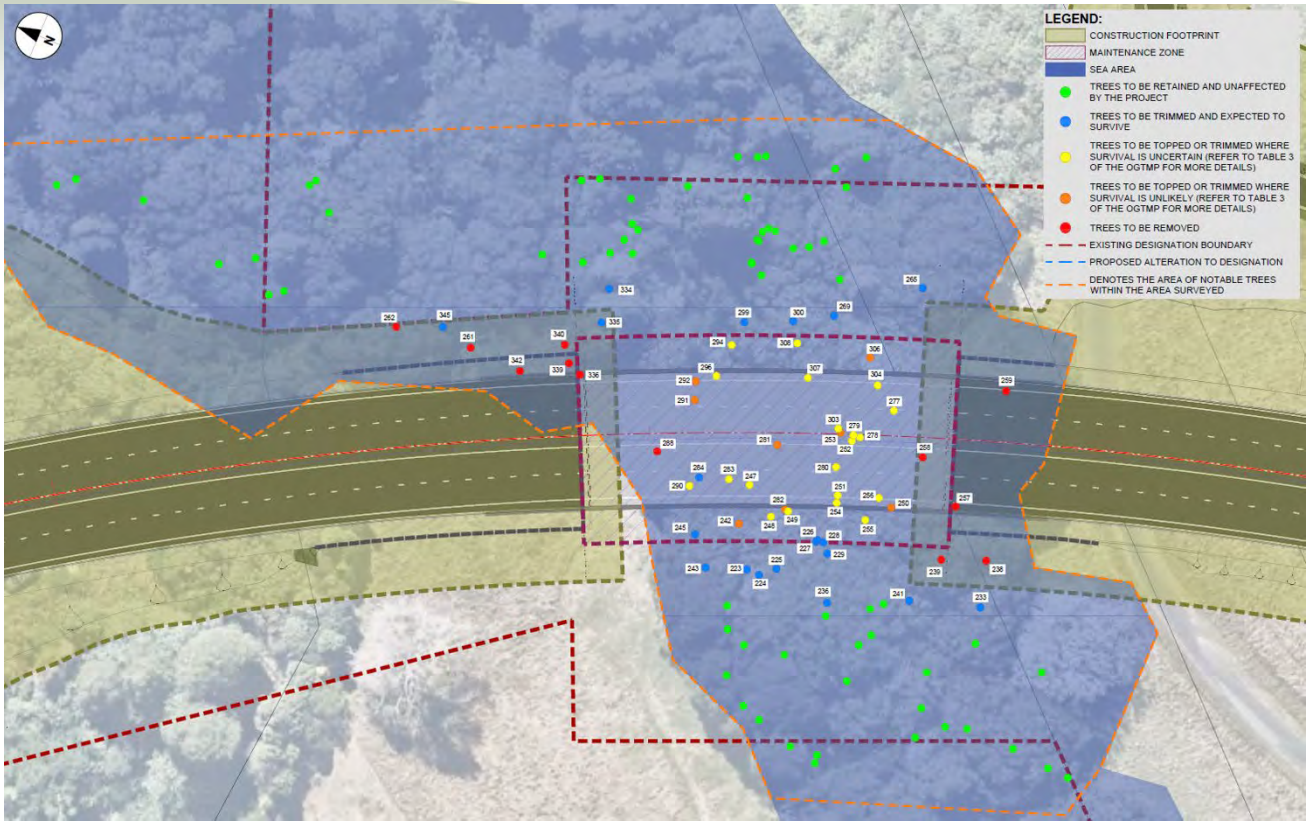


Figure 7 Cheesman's Bush bridge Significant Trees and potential impacts

4.2 38 Mill Road (Puhinui Gully / Watercare Bush)

Significant work has also been carried out in relation to the design of the Puhinui Bridge to avoid adverse effects on Significant Trees (refer to Part C of the SAR). Following further optioneering, a revised alignment was adopted that avoids the need to remove any trees classified as 'old growth' (i.e., Tree 422 shown on **Figure 9** below). The revised alignment includes a complete shift of the bridge approximately 19 metres to the northeast. This change also minimises the impacts on higher-quality areas of the SEA. **Figure 8** below shows the evolution of the Puhinui Gully bridge design.

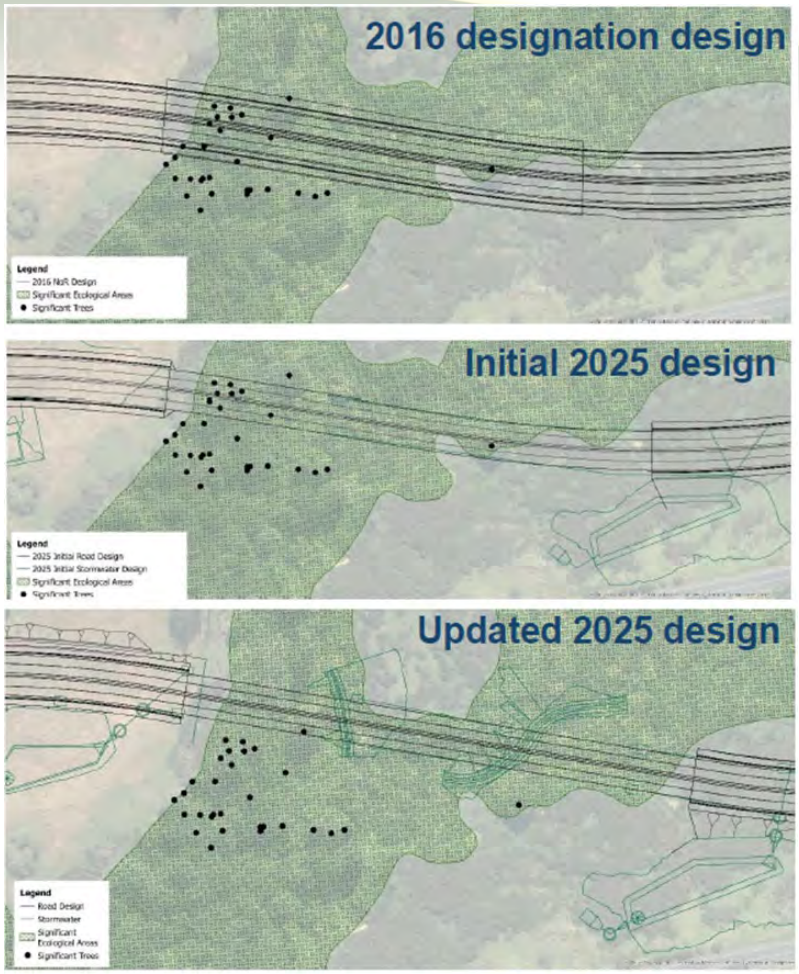


Figure 8 Evolution of the Puhinui Gully bridge design

The areas impacted by the new bridge alignment are largely within an area of regenerating vegetation. The shift will impact a larger area of regenerating vegetation but avoid the more mature vegetation and most of the Significant Trees to the south. While this is a significant improvement from an arboricultural and forest health perspective, the proposed shift will result in an increase in overall vegetation clearance within the lower quality area.

Figure 9 shows the areas required for the construction footprint. The areas outside the construction footprint will not be disturbed. Tree trimming and pruning will be required to maintain a Bridge Maintenance Area of 2m buffer under the bridge (and extending 5m either side of the bridge) the same as proposed in relation to the Cheesman's Bridge area, as described above.

The construction of the Puhinui Gully bridge has the potential to impact a total of five (5) Significant Trees (ranging between 'mature, 'large' and 'old growth / remnant'). The potential impacts are shown in **Figure 9**, summarised in **Table 4-2** below and set out in more detail in Table 2 of the OGTMP.

Two kahikatea trees classified as 'large' trees will require removal as they are either growing towards the bridge with potential for failure or damage in the future (Tree 43) or within the bridge footprint (Tree 42). The logs from these trees will be offered to Mana Whenua for repurposing in the first instance (refer to Part C of the SAR and the OGTMP). Three other Significant Trees will be underneath the bridge structure. These

trees are identified as being able to be retained but may require low level pruning as they are growing into or will overhang the Bridge Maintenance Area.

The OGTMP sets out how topped or trimmed trees will be managed and requires that a suitably qualified and experienced Project Arborist (who holds a minimum Level 4 arboricultural qualification) oversee construction works within Puhinui Gully.

Table 4-2 Summary of impacted trees within Puhinui Gully

Tree impact activity	Trees to be completely removed	Trees to be topped		Total potentially impacted trees
		Likely to survive	Uncertain or unlikely to survive	
Puhinui Bridge and associated earthworks	2	3	0	**5**

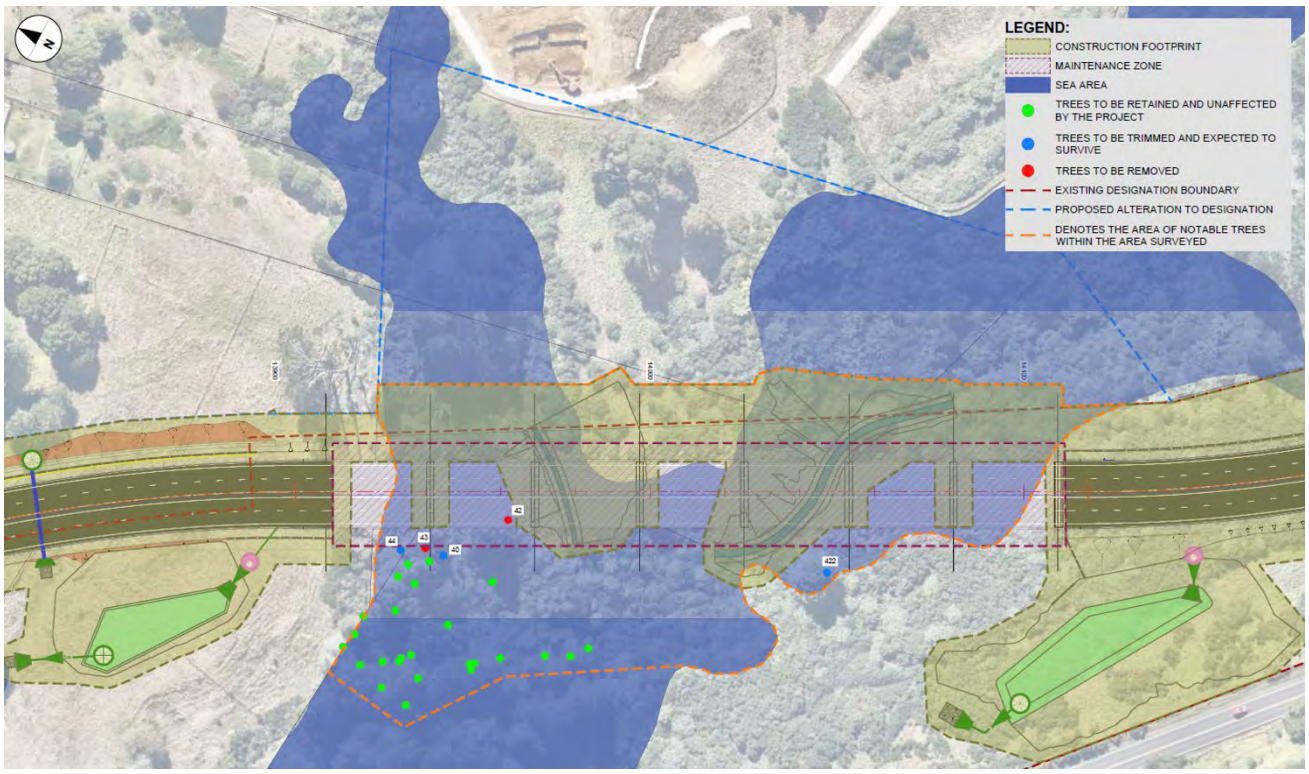


Figure 9 Puhinui Gully bridge Significant Trees and potential impacts

4.3 Everglade Reserve, Kingsclere Place Reserve, Goodwood Drive, Tōtara Park and 134 Mill Road

The areas impacted by the Project within the Everglade Park, Kingsclere Place Reserve, and Goodwood Drive SEAs and Tōtara Park contain existing vegetation and trees.

The Project works in these areas will involve:

a) Construction of batter slopes at Tōtara Park;

b) Stormwater infrastructure in Everglade Park, 134 Mill Road and Tōtara Park; and

c) Road tie in works at Kingsclere Place Reserve and Goodwood Drive Reserve.

The potential impacts of the Project on trees and vegetation within each of these areas is as follows:

a) **Tōtara Park** – The vegetation that will be affected by the Project consists of planted indigenous species dominated by regenerating mānuka, tī kōuka and kōwhai. The Project works will avoid the more significant vegetation to the west of Group 164, notably the kahikatea grouping (refer to **Table 3-1**).

b) **Everglade Park** – Impacts on trees and vegetation within the SEA extent will be limited to the removal of roots and associated works within the Protected Root Zone (**PRZ**) of small pioneer / self-sown indigenous vegetation (e.g., coprosma sp.). Further design refinements were undertaken at this location so that the proposed discharge outlet avoids the main grouping of mature tōtara trees within the SEA.

c) **Kingsclere Place Reserve and Goodwood Drive Reserve** – No vegetation removal is required within these SEAs. Some works are likely to occur within the PRZ of the trees that overhang the road reserve. However, these will occur in an area which is currently impervious, therefore, any effects on these trees are expected to be minimal (if any) and acceptable from an arboricultural perspective.

d) **134 Mill Road** – Direct impacts on trees (including mature species located in Tree Group 179) have largely been avoided through further refinement of the proposed stormwater outfall design.

5.0 Measures to manage effects on trees

The mitigation measures recommended to manage the potential effects of the Project on trees identified through this assessment are shown in **Table 5-1**.

Table 5-1: Proposed management measures

Proposed management measures	Description
Old Growth Tree Management Plan	The OGTMP: • Identifies the Significant Trees to be removed and methods for removal; • Contains a requirement for the Significant Trees that are removed to be offered to Mana Whenua for repurposing; • Contains protocols for tree topping, pruning and trimming of Significant Trees within Puhinui Gully and Cheesman's Bush; • Sets out the requirements for leaving any Significant Trees that are pruned or trimmed in situ in the event that they do not survive following pruning or trimming;

	• Outlines the requirements for ongoing maintenance activities; and • Sets out the requirements for reporting.
Works within the PRZ of tree(s) not authorised for removal	A condition is proposed on the designations to manage works within the PRZ of trees within Everglade Park and Tōtara Park that are not authorised to be removed. This includes a requirement for a Suitably Qualified Person to be on site to oversee that works are undertaken in accordance with best arboricultural practice.

s9(2)(a)

Matthew Paul
Director
Peers Brown Miller Ltd
s9(2)(a)

APPENDIX C Ecological Impact Assessment Guidelines

My method for assessing the significance of the ecological effects associated with the Project was based on the Environment Institute of Australia and New Zealand's (EIANZ) Ecological Impact Assessment Guidelines (EIANZ, 2018).

In summary, this method requires an assessment of:

- Ecosystem/habitat and species values as described in Section C.1;
- The magnitude of effect using the criteria listed in Section C.2; and
- The level of ecological effect using the decision matrix presented in Section C.3, which determines the level of effect based on the ecological value of the ecosystems or species assessed and the magnitude of effect.

C.1 Ecological values assessment method

Ecological value has aspects of both quantity (rarity or extent) and quality (integrity, functionality or condition) and incorporates an array of attributes across multiple levels of ecological organisation (species, communities, habitats and ecosystems). The EIANZ impact assessment guidelines (Roper-Lindsay et al., 2018) (EIANZ Guidelines) provide a summary scale whereby a site's value is assessed as the extent to which an area or site exemplifies qualities of representativeness, rarity/distinctiveness, diversity and pattern, and ecological context characteristic of its ecosystem type.

I have assessed terrestrial ecosystems / communities / habitats and species in the proposed designation against the EIANZ Guidelines criteria (Table 9-1 and Table 9-2) to determine the overall value of the features.

Table 9-1: Criteria to consider for ecological value of terrestrial habitats and species (modified from EIANZ Guidelines)

Matter	Assessment considerations terrestrial
Representativeness	Criteria for representative vegetation and aquatic habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally uncommon species • Regional or national distribution limits of species or communities

Matter	Assessment considerations terrestrial
	• 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 utilization.
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 9-2: Criteria for assigning ecological value to habitats and species (modified from EIANZ Guidelines)

ECOLOGICAL VALUE	SPECIES	VEGETATION & HABITATS
Very High	Threatened - (Nationally Critical, Nationally Endangered, Nationally Vulnerable)	Area rates High for 3 or all of the four or five assessment matters listed in Table 9-1. Likely to be nationally important and recognised as such.
High	At-risk - (Declining)	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	At-risk - (Recovering, Relict, Naturally Uncommon) Locally (Ecological District) uncommon or distinctive species	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	Native - *Not Threatened*. Nationally and locally common indigenous species.	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	**Exotic species, including pests, species having recreational value.**	**Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder.**

C.2 Assessing magnitude of effect

Once the value of the ecosystem components had been determined, I then assessed the magnitude of the effect of the Project on that ecosystem. Magnitude of effect is a measure of the extent or scale of the impact, its duration, and the degree of change that it will cause to the relevant ecosystem. A typical scale of magnitude ranges from very high to negligible as outlined in (Table 9-3).

Table 9-3. Criteria for describing magnitude of effect (Roper-Lindsay et al., 2018).

Magnitude of Effect:	Description:
Very High	Total loss of, or very major alteration to, key elements/ features of the baseline conditions, such that the post development character, composition and/or 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 conditions such that post development character, composition and/or 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 and/or attributes of the existing 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 and/or attributes of existing baseline condition will be similar to predevelopment 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.

C.3 Assessing level of ecological impact

I determined the overall level of the effect by applying the following matrix (Table 9-4), which combines the ecological value of an area and magnitude of effect of the Project on this area to determine the overall level of ecological effect. Note I have modified the wording of the level of effect associated with Positive magnitudes of effect from “net gain” in the EIANZ Guidelines to “positive”. I have done this to maintain clarity between the language used for a net gain as calculated and validated through a modelled/calculated offset and expected positive effects on the basis of the qualitative assessment used through the EIANZ Guidelines.

Table 9-4: Matrix of level of adverse effect (modified from EIANZ Guidelines).

		Ecological value				
		Very High	High	Moderate	Low	Negligible
Magnitude	Very High	--- (Very High)	--- (Very High)	--- (High)	--(Moderate)	- (Low)
	High	--- (Very High)	--- (Very High)	-- (Moderate)	- (Low)	0 (Very Low)
	Moderate	--- (High)	--- (High)	-- (Moderate)	- (Low)	0 (Very Low)
	Low	-- (Moderate)	- (Low)	- (Low)	0 (Very Low)	0 (Very Low)
	Negligible	- (Low)	0 (Very Low)	0 (Very Low)	0 (Very Low)	0 (Very Low)
	Positive	**+ (Positive)**	**+ (Positive)**	**+ (Positive)**	**+ (Positive)**	**+ (Positive)**

APPENDIX DLizard Habitats and Surveys

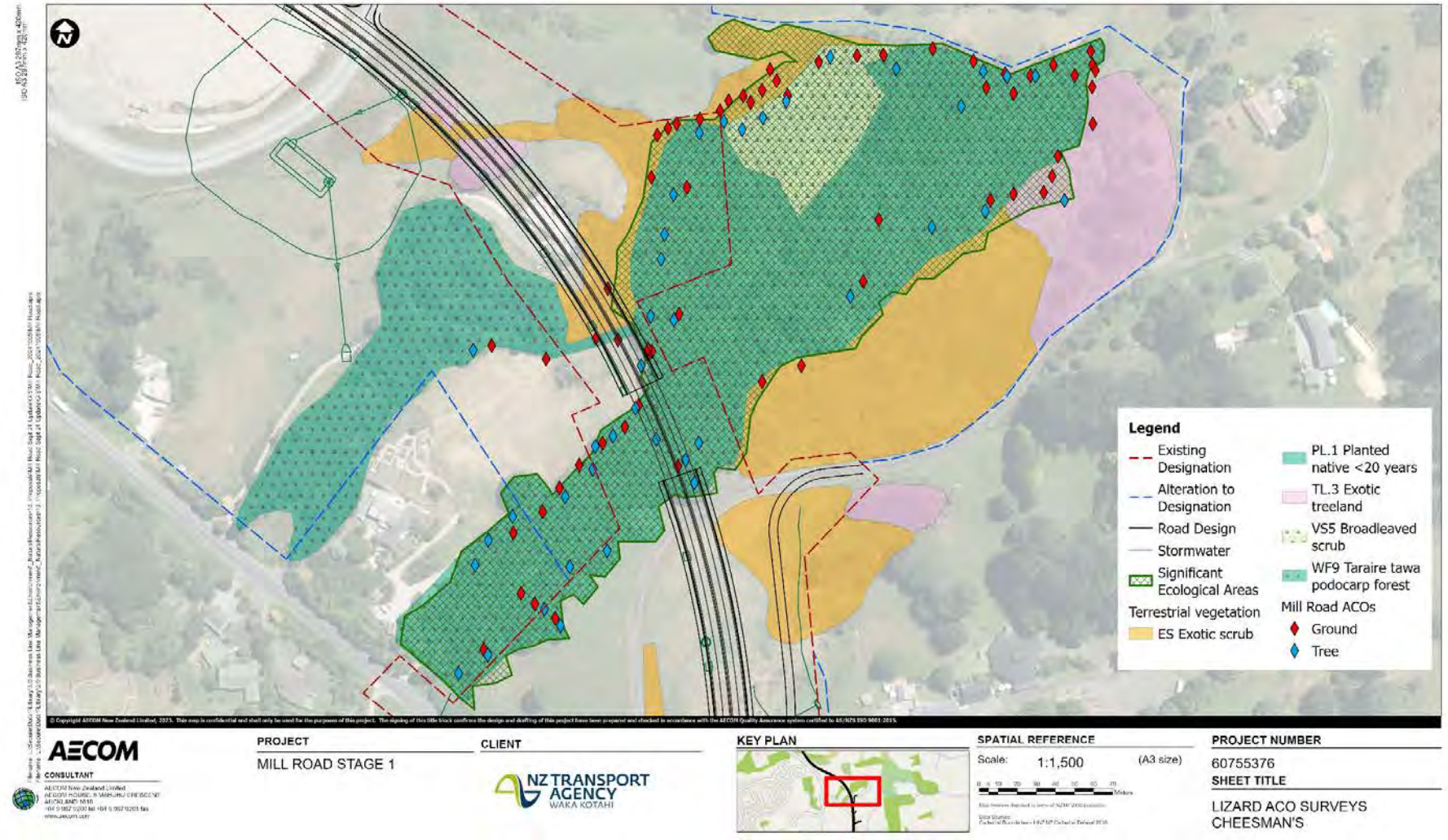


Figure 9-1: 2025 Lizard surveys in Cheesman's Bush. ACO locations shown in red (ground ACOs) and blue (tree ACOs)

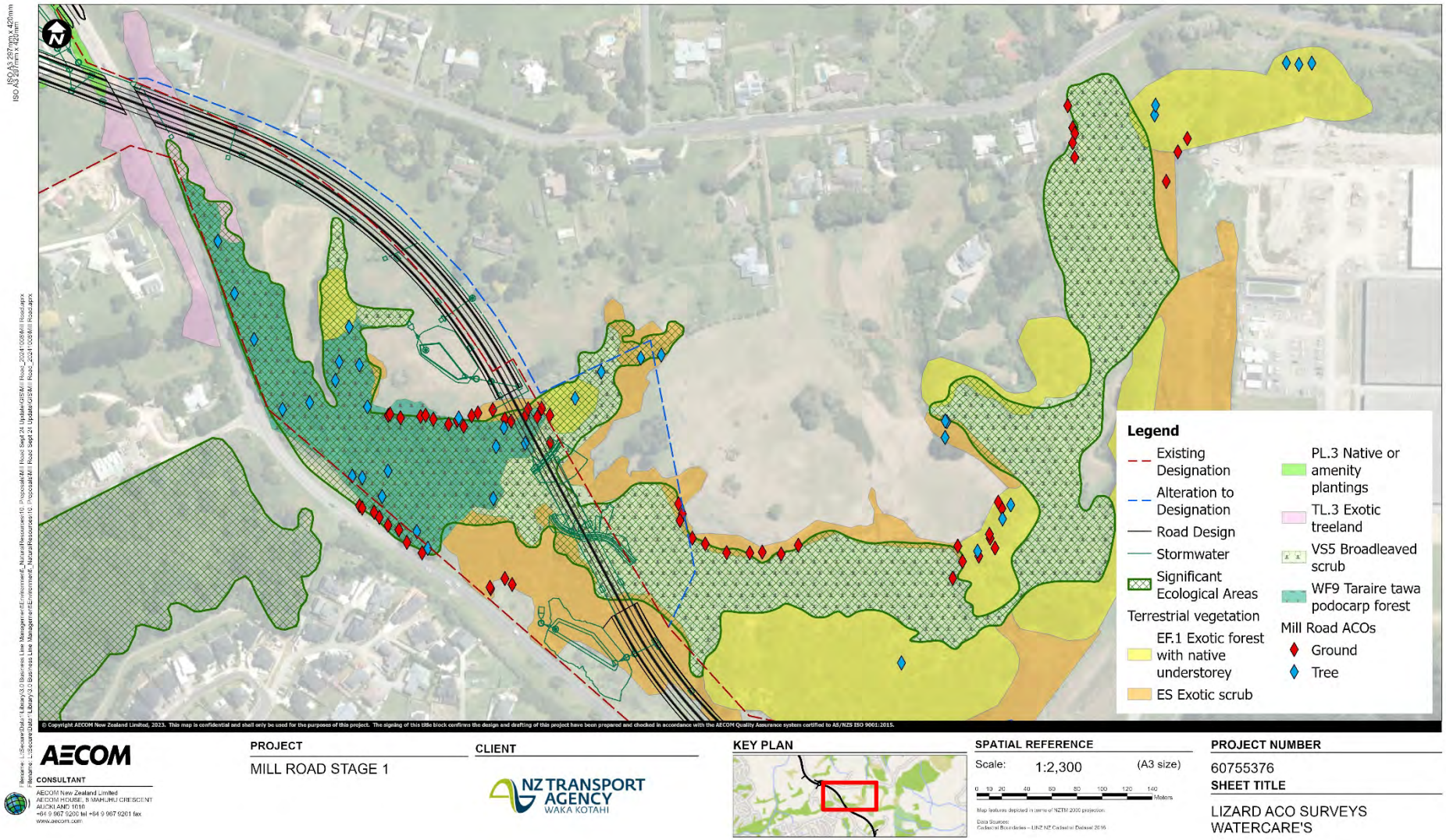
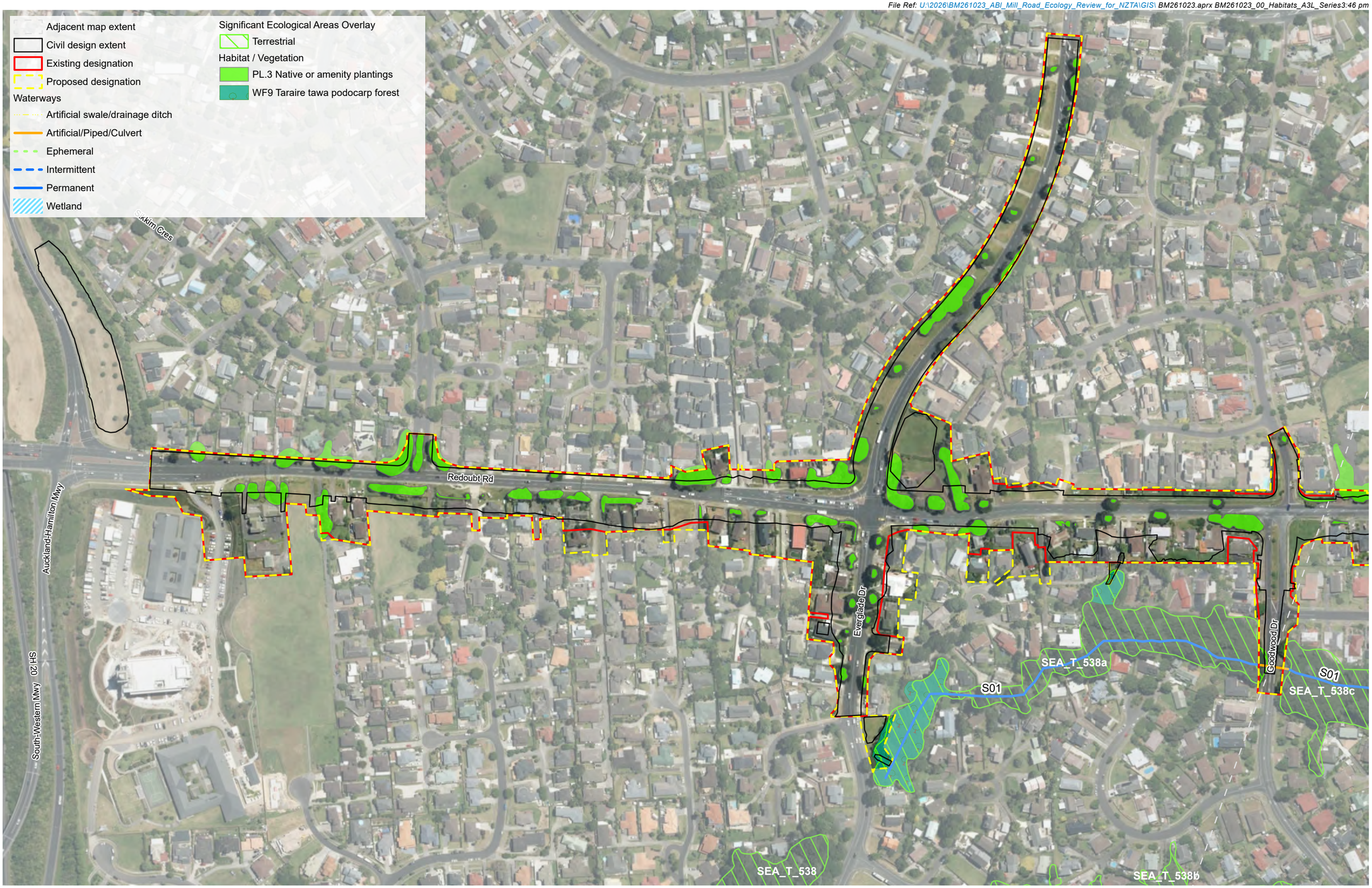


Figure 9-2: 2025 Lizard surveys in Puhinui Gully. ACO locations shown in red (ground ACOs) and blue (tree ACOs)

APPENDIX E Terrestrial Ecological Mapping



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Projection: NZGD 2000 New Zealand Transverse Mercator

MILL ROAD ECOLOGY REVIEW

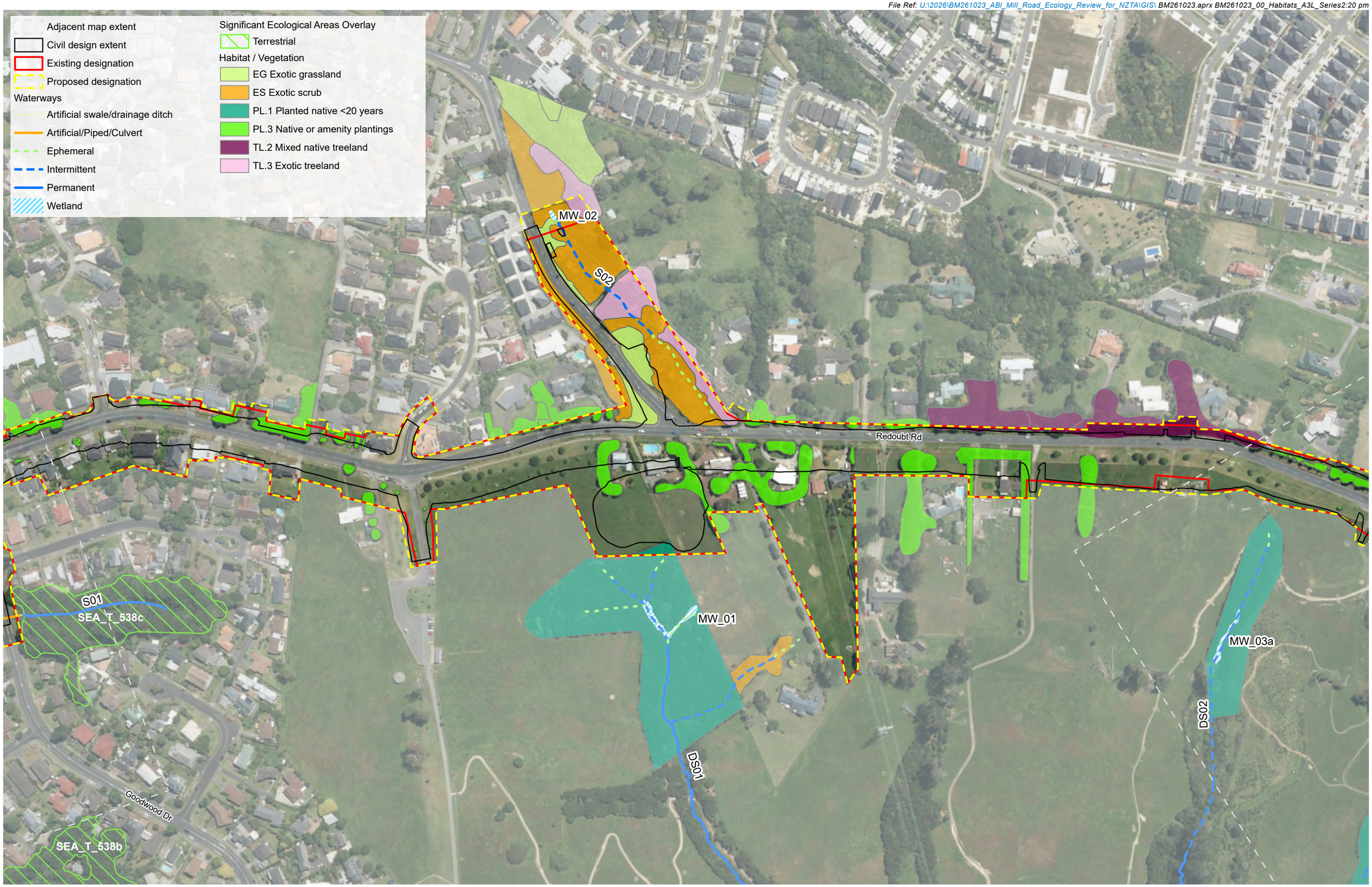
Ecological Features

Date: 30 July 2026 | Revision: 0

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Project Manager: s9(2)(a) | Drawn: LJa | Checked: ABI

Map 1



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MILL ROAD ECOLOGY REVIEW

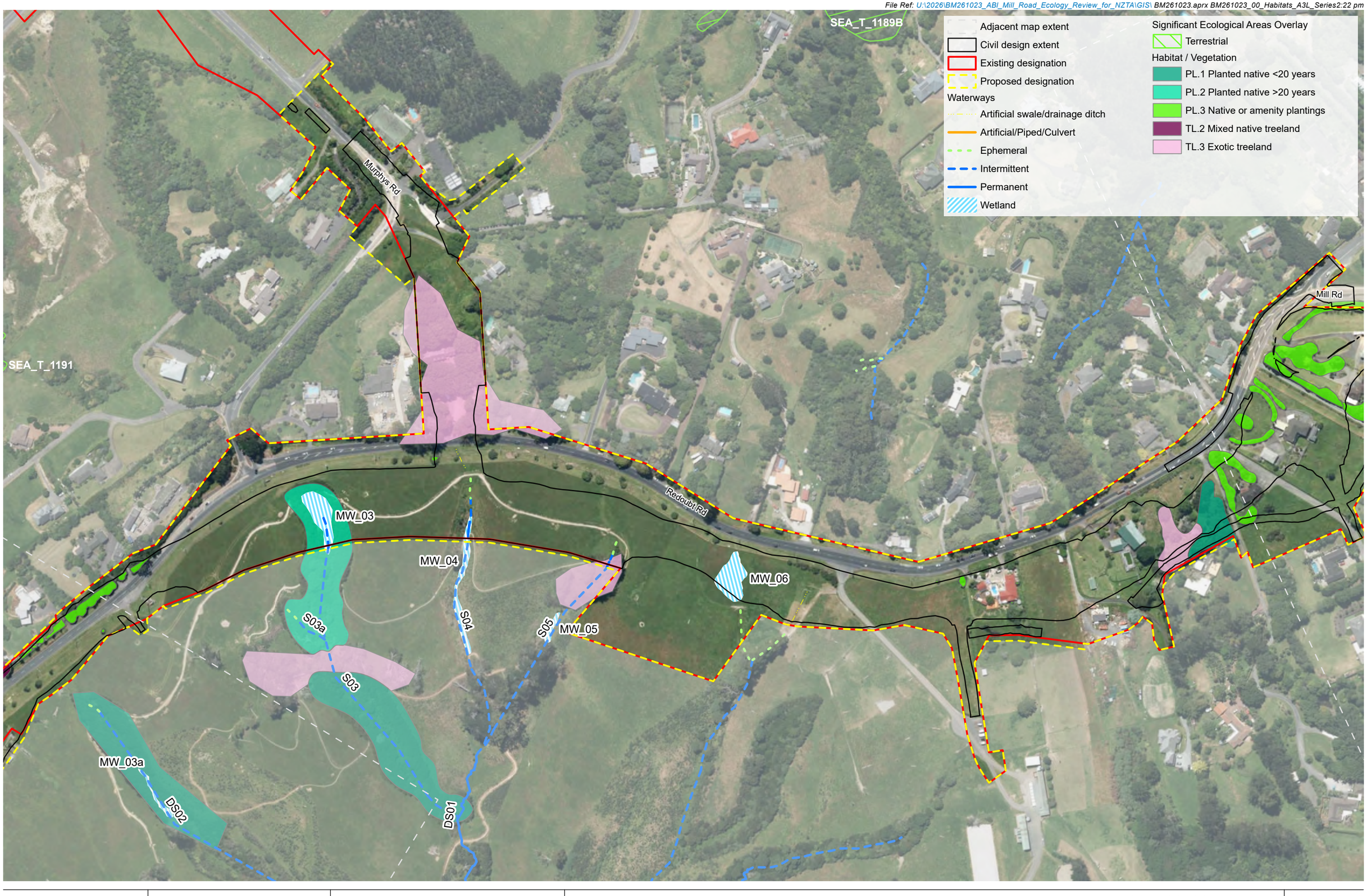
Ecological Features

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Map 2



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Projection: NZGD 2000 New Zealand Transverse Mercator

MILL ROAD ECOLOGY REVIEW

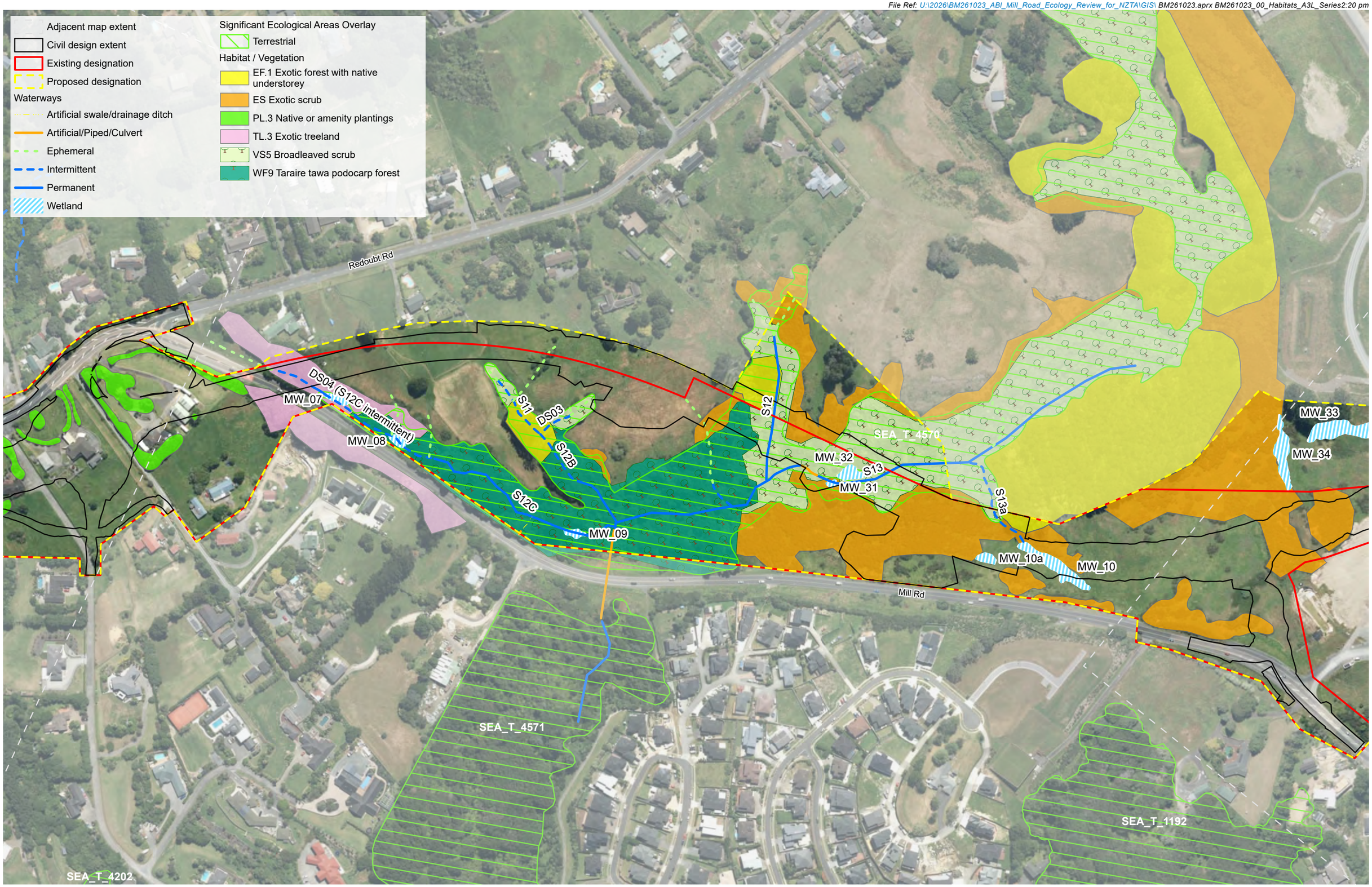
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Map 3



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Projection: NZGD 2000 New Zealand Transverse Mercator

MILL ROAD ECOLOGY REVIEW

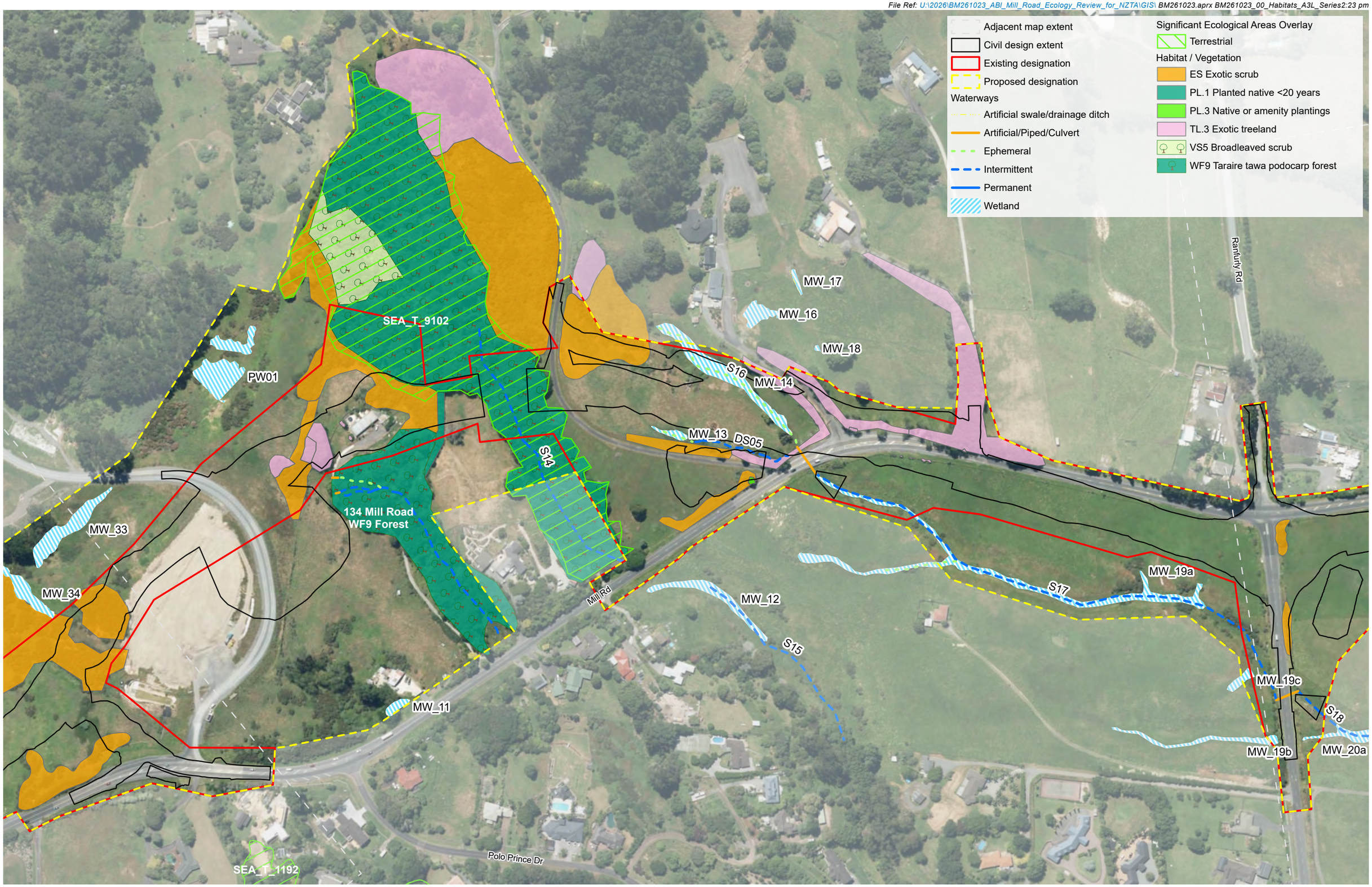
Ecological Features

Date: 24 July 2026 | Revision: 0

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Project Manager: s9(2)(a) | Drawn: LJa | Checked: ABl

Map 4



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MILL ROAD ECOLOGY REVIEW

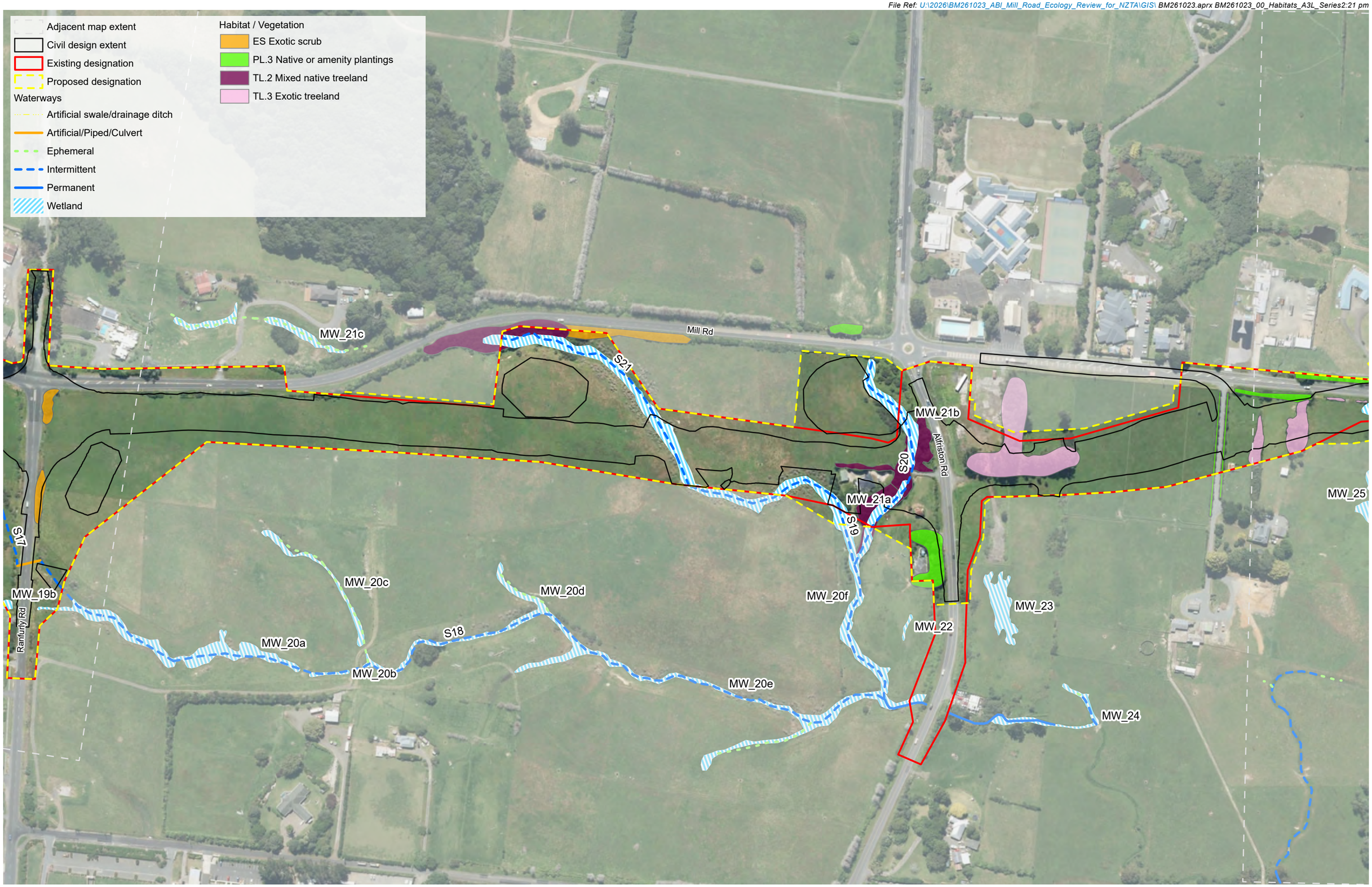
Ecological Features

Date: 24 July 2026 | Revision: 0

Plan prepared for NZTA by Boffa Miskell Limited

Project Manager: s9(2)(a) | Drawn: LJa | Checked: ABI

Map 5



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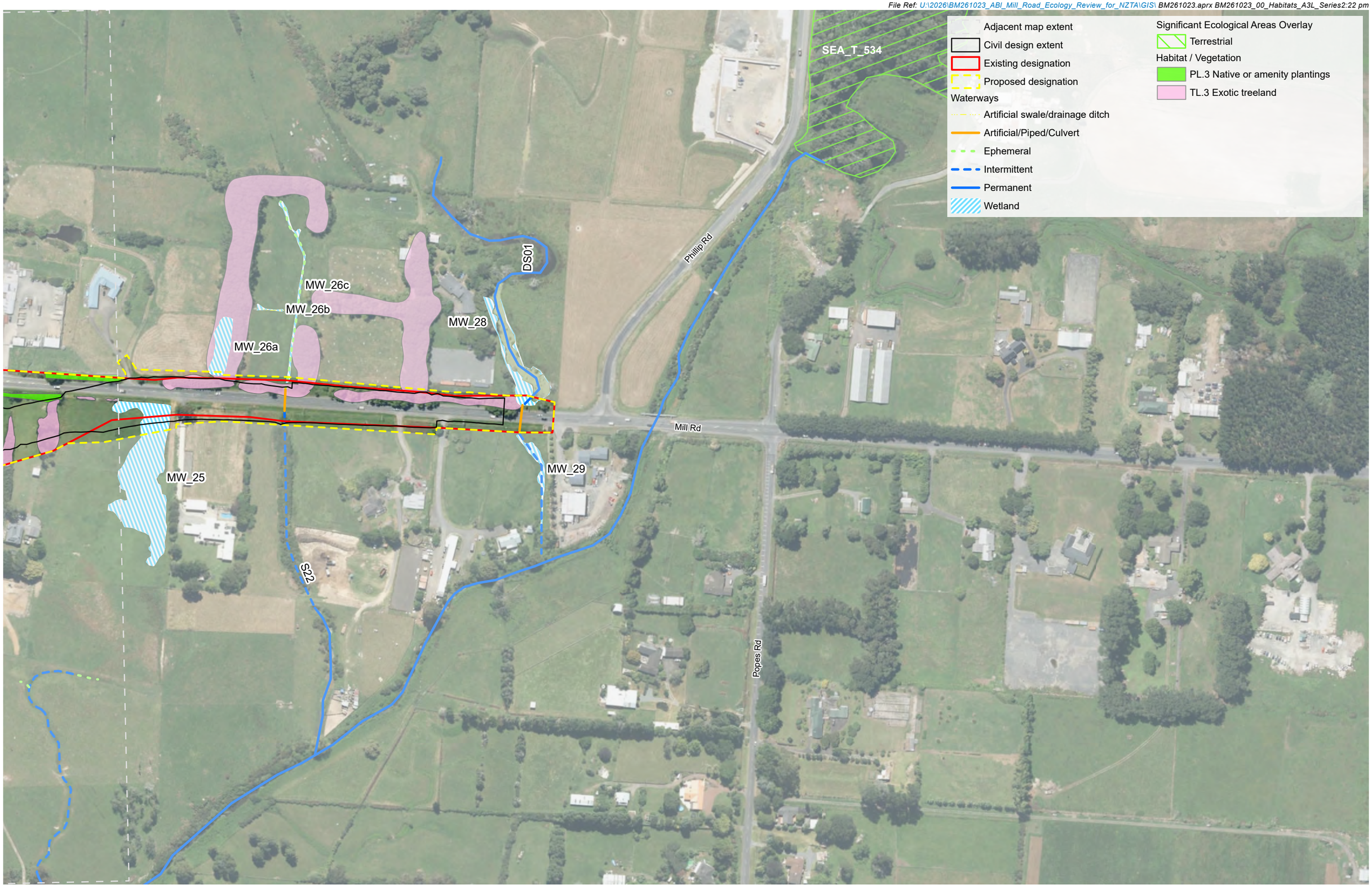
Ecological Features

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Map 6



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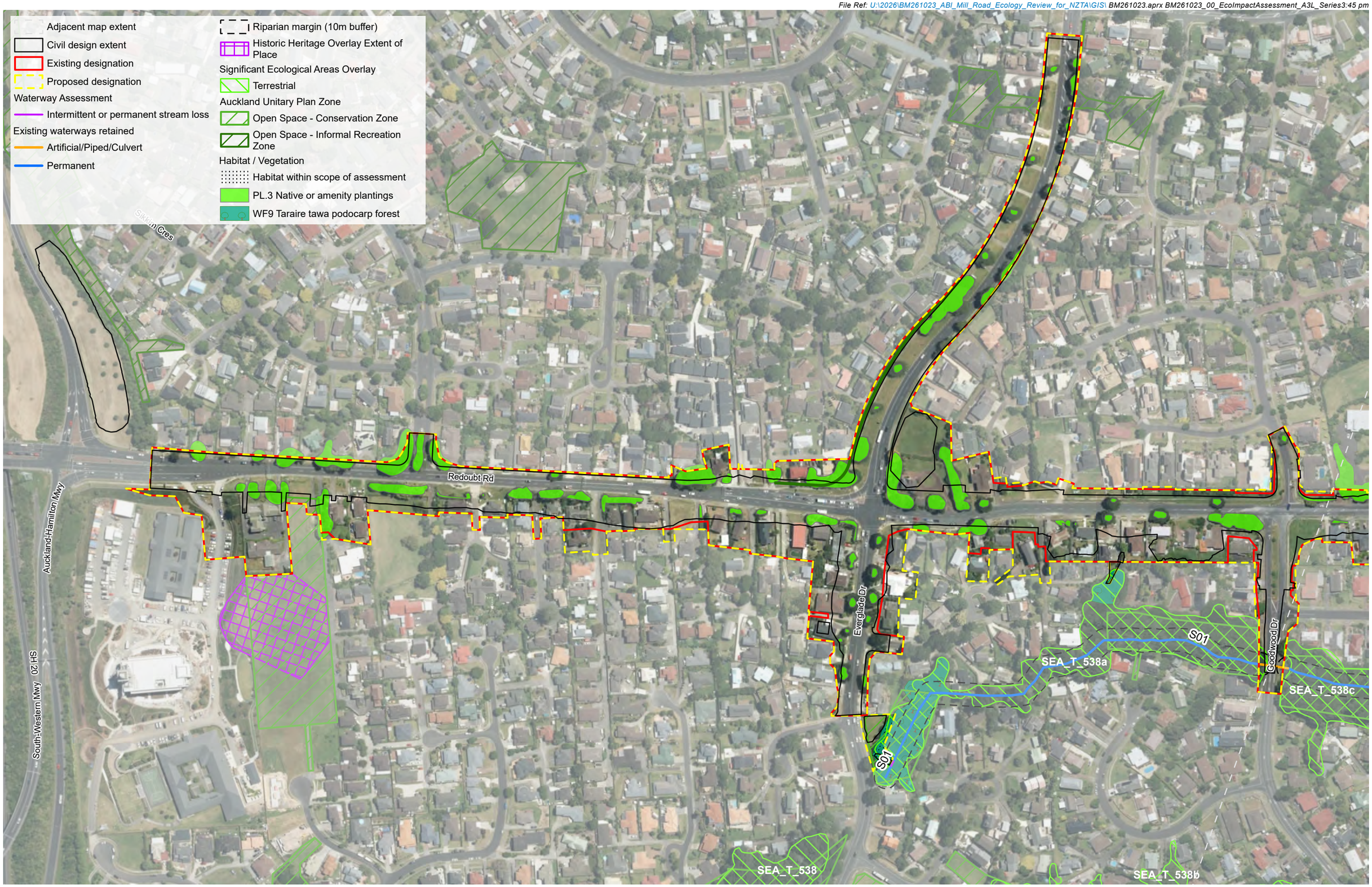
Ecological Features

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Map 7



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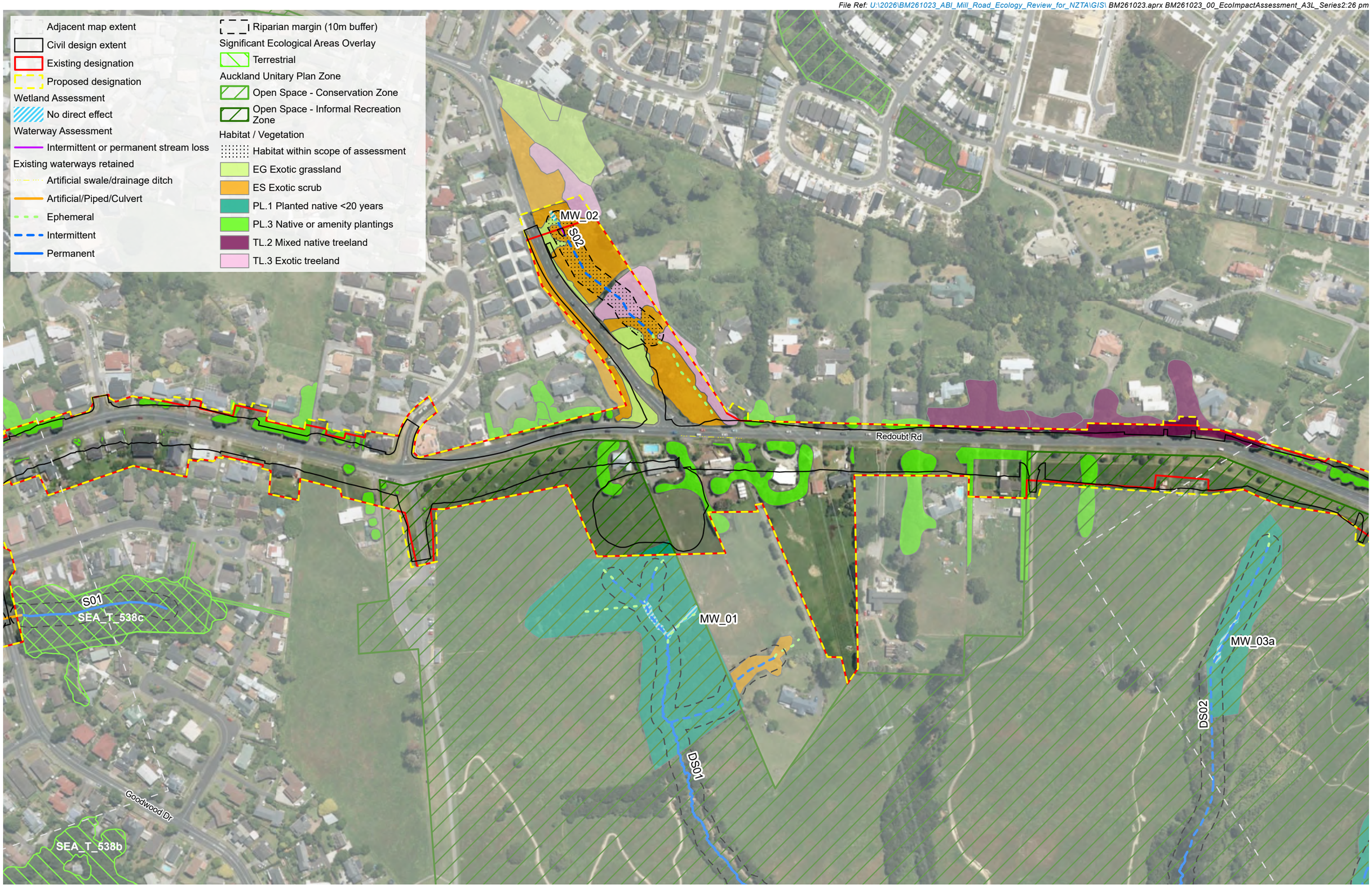
Ecological Impact Assessment

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Map 1



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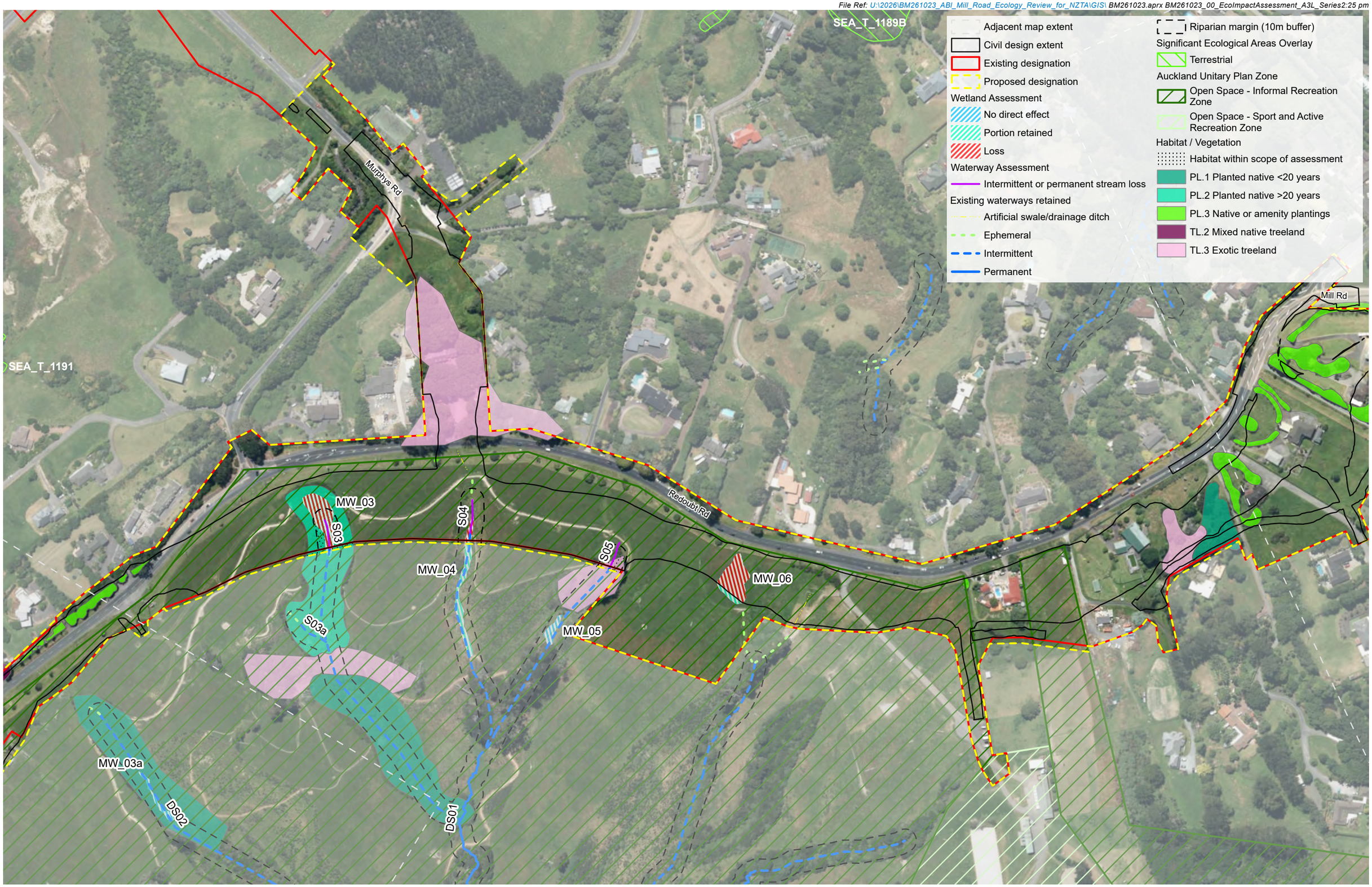
Ecological Impact Assessment

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Map 2



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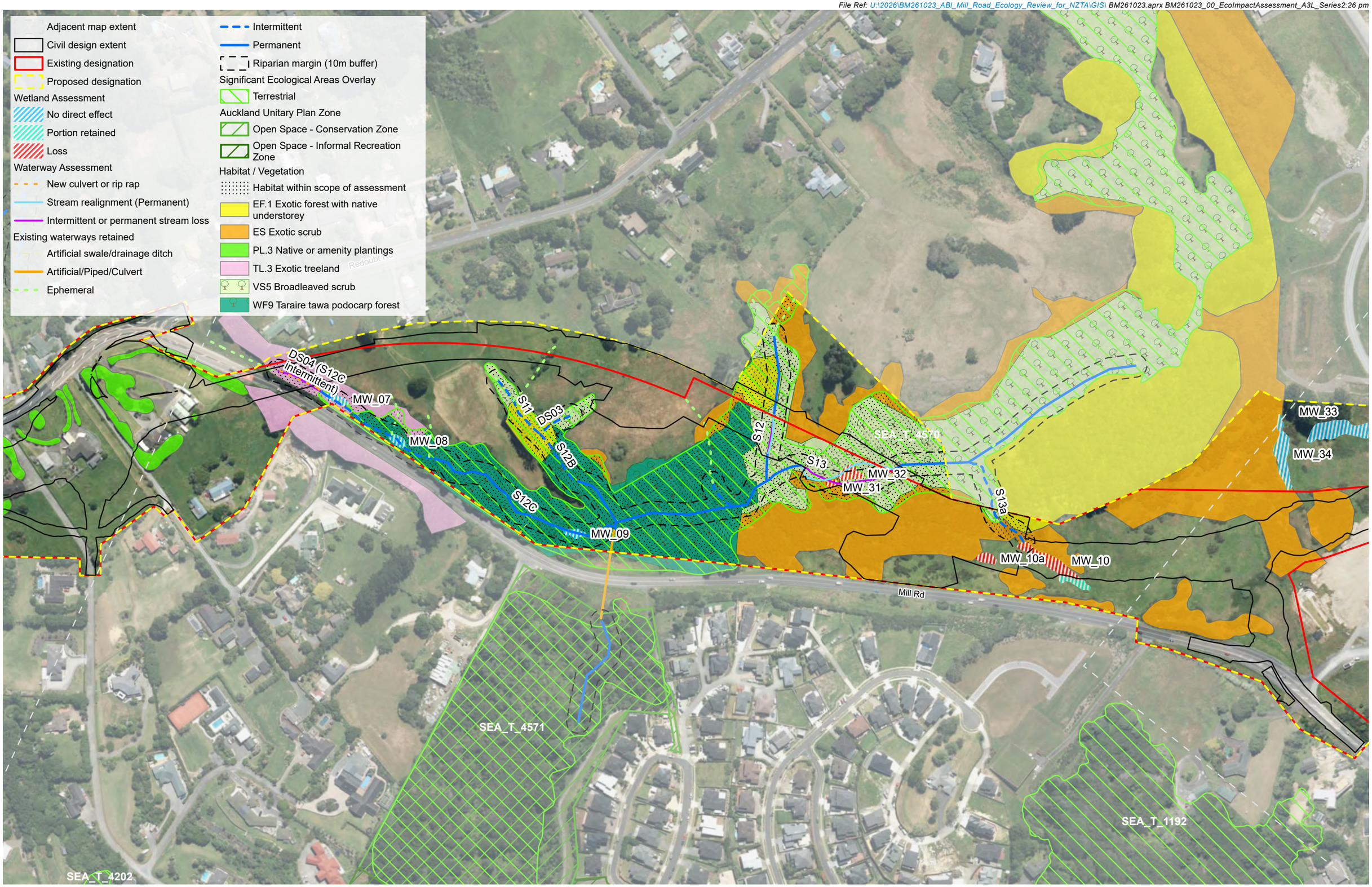
Ecological Impact Assessment

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Map 3



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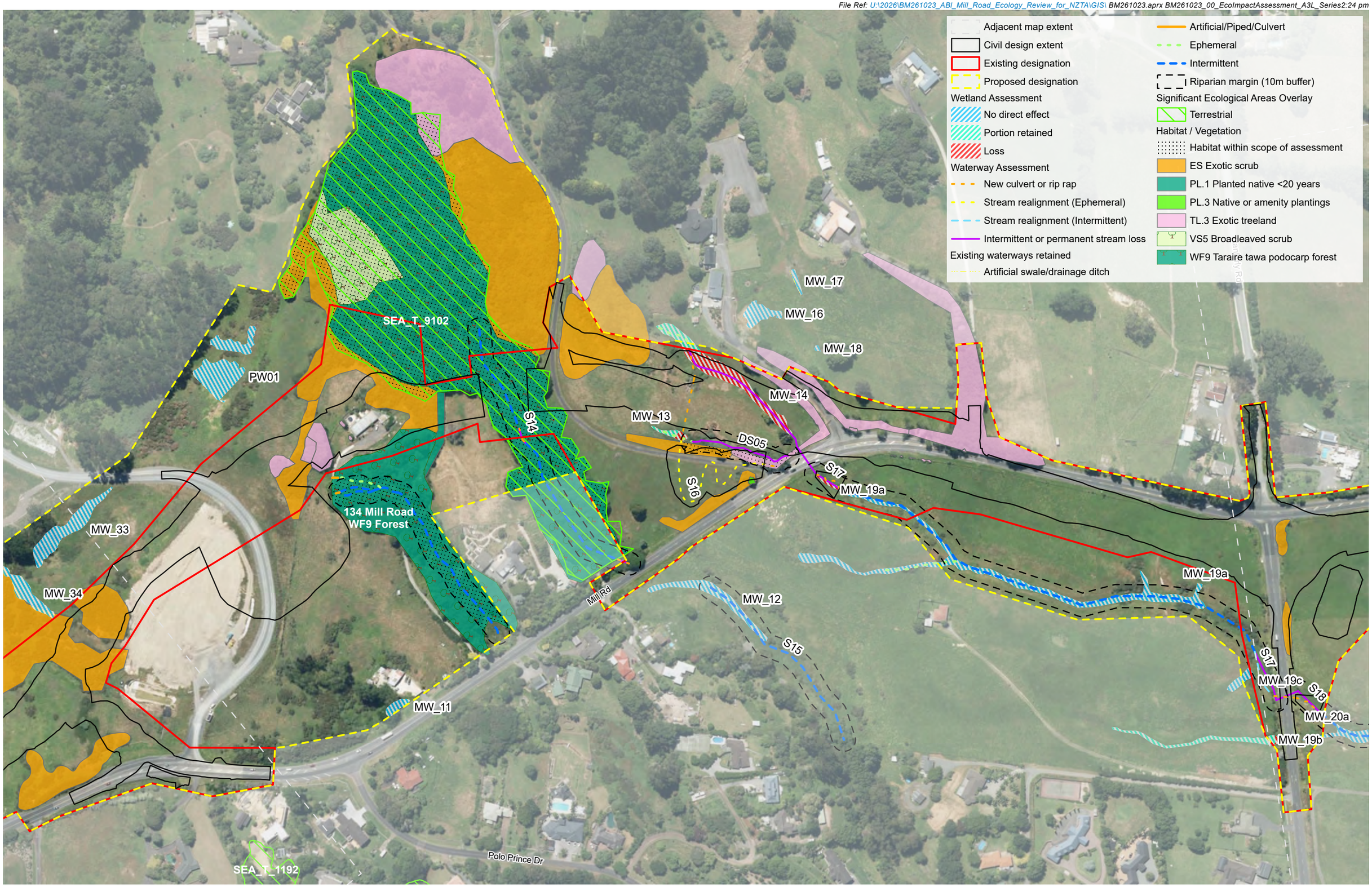
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Map 4



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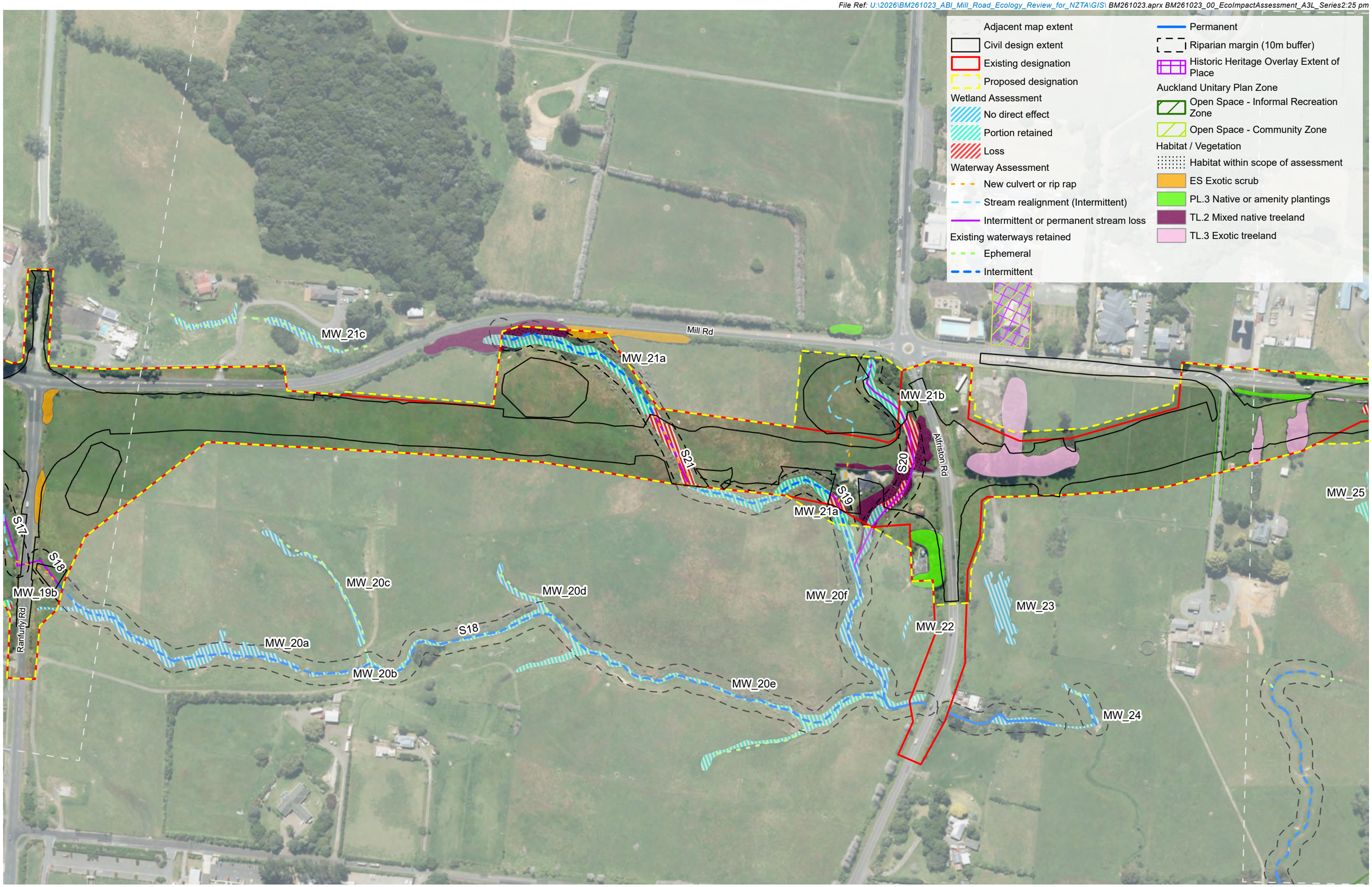
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Map 5



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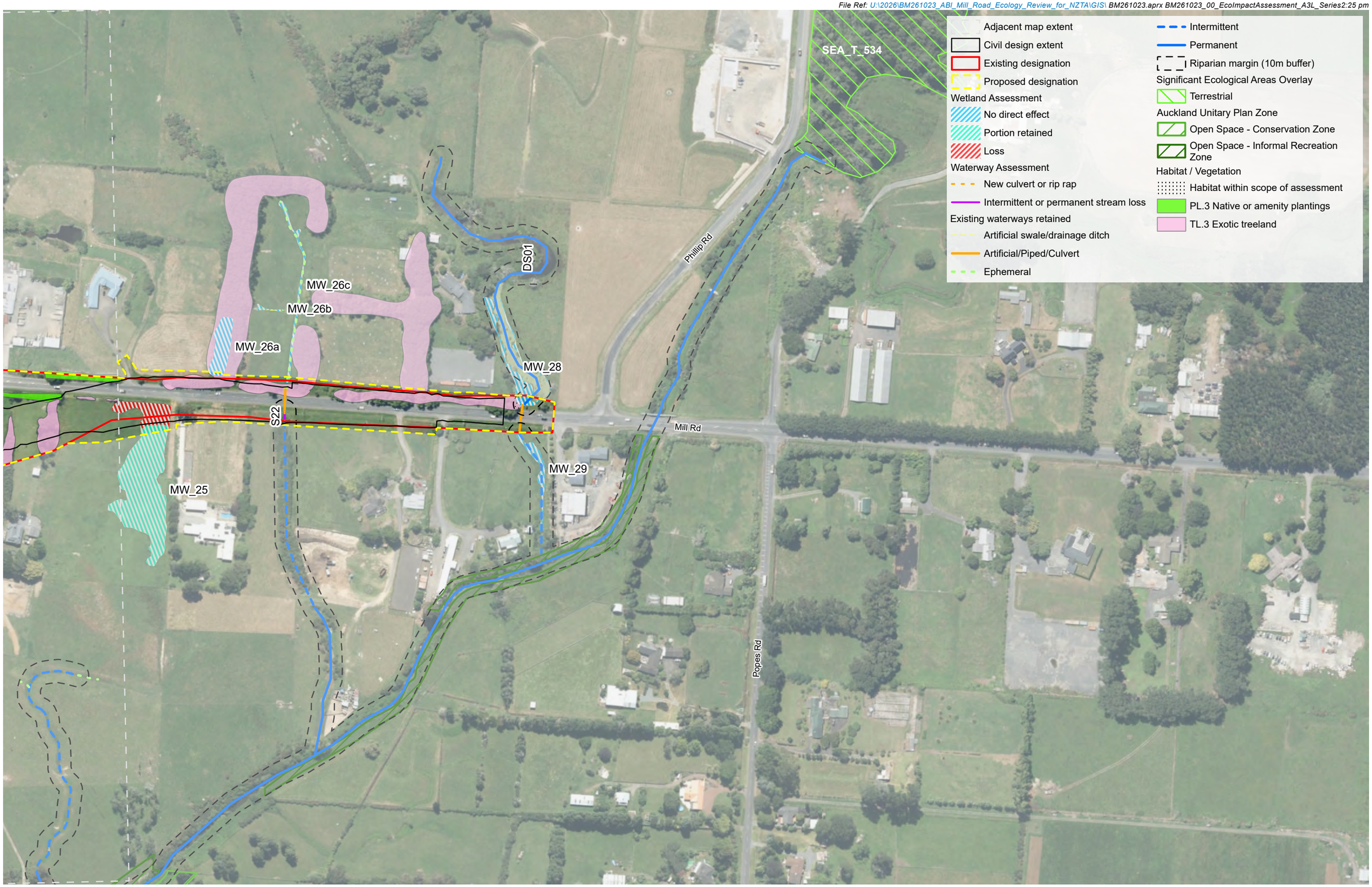
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Map 6



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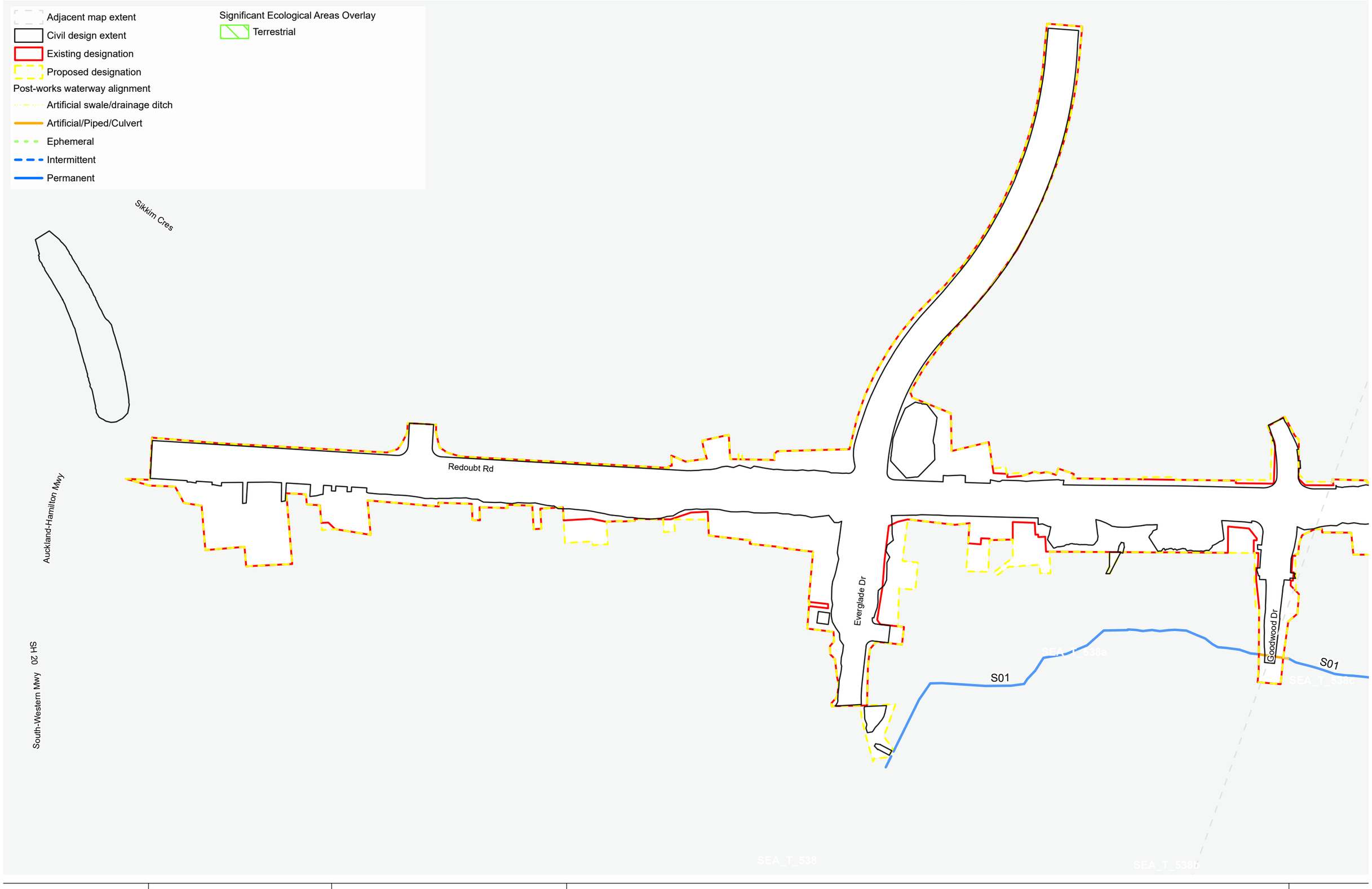
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Map 7



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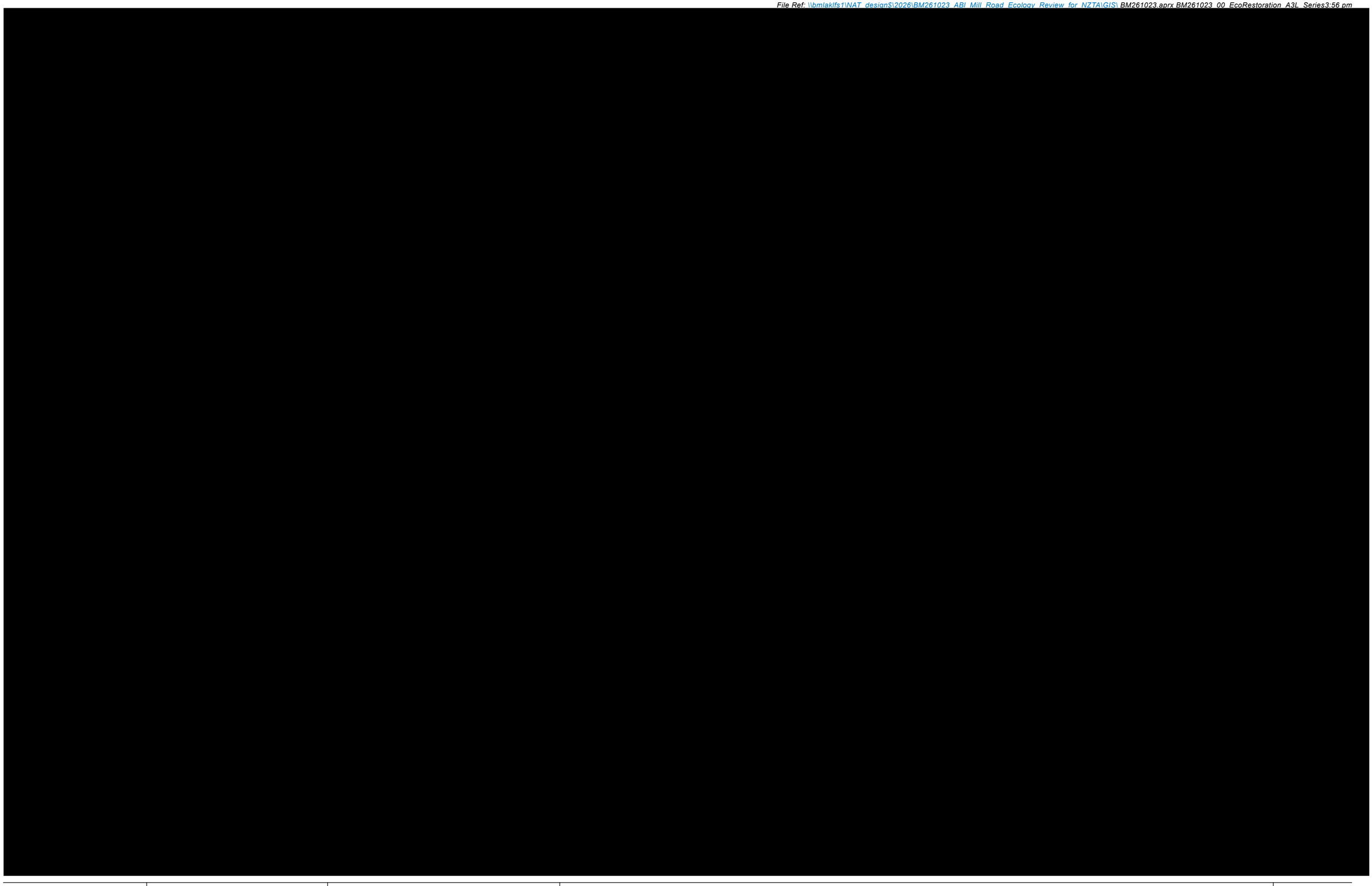
Ecological Restoration Extents

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Map 1



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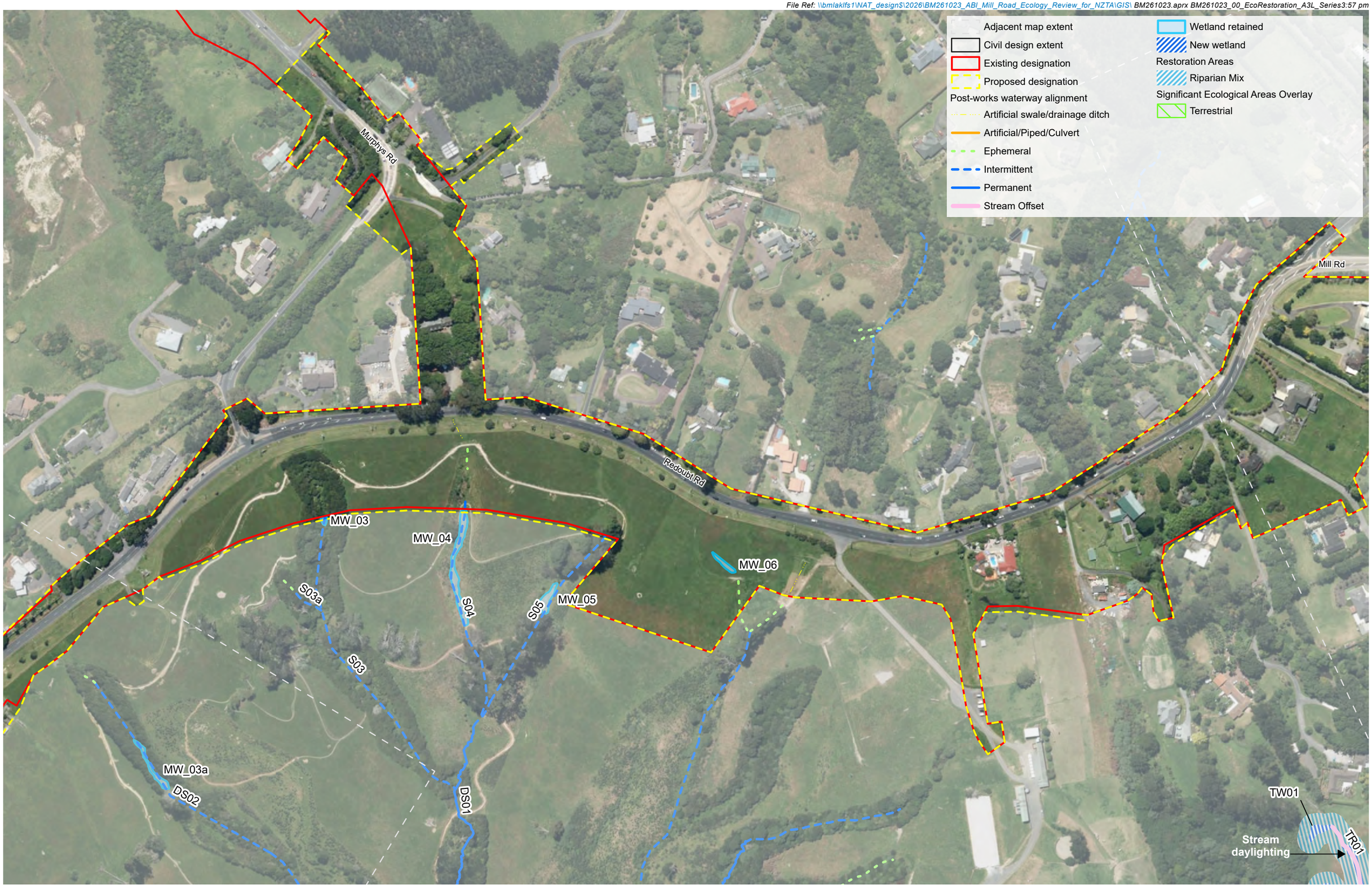
Ecological Restoration Extents

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Map 2



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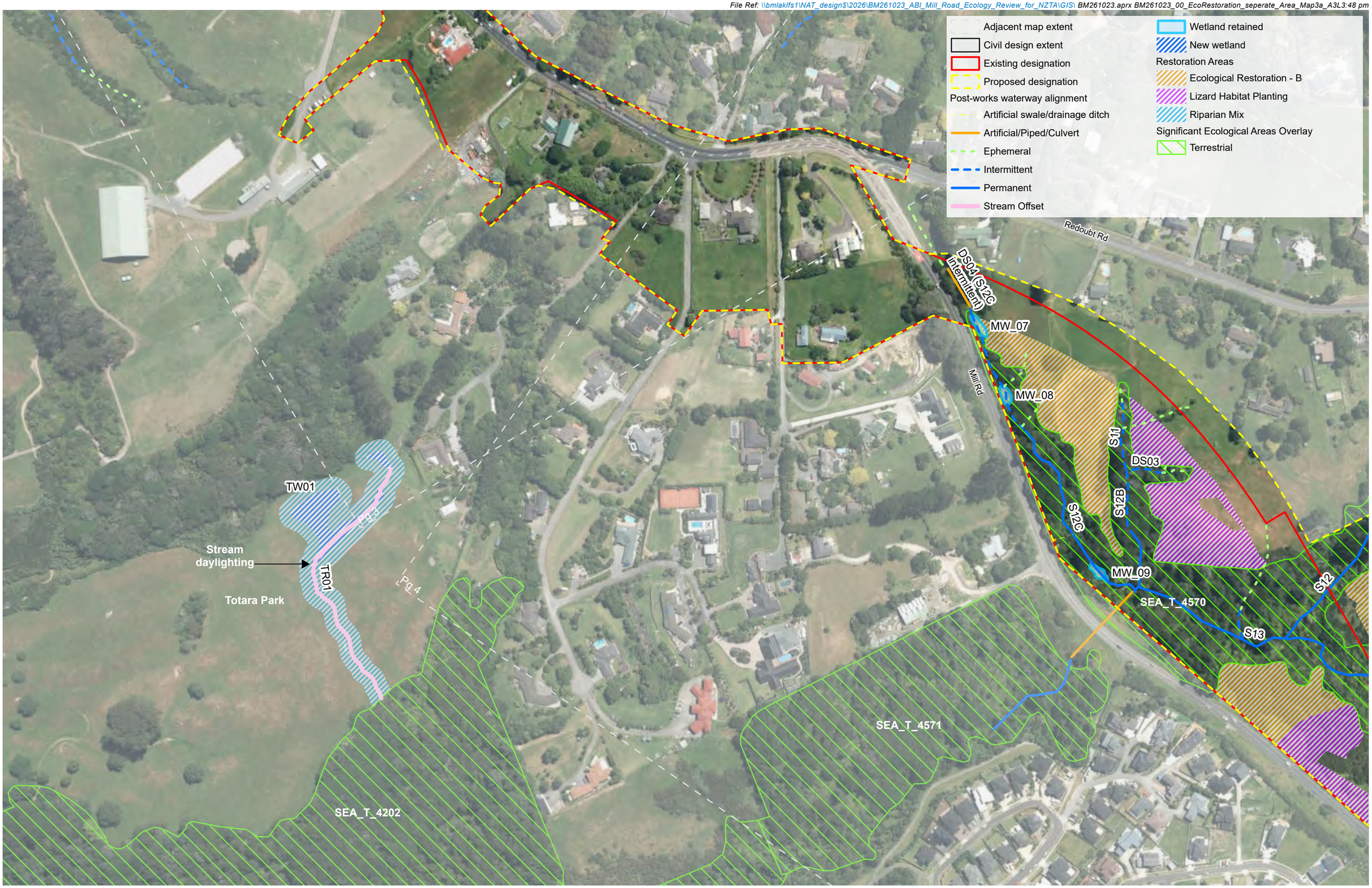
Ecological Restoration Extents

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Map 3



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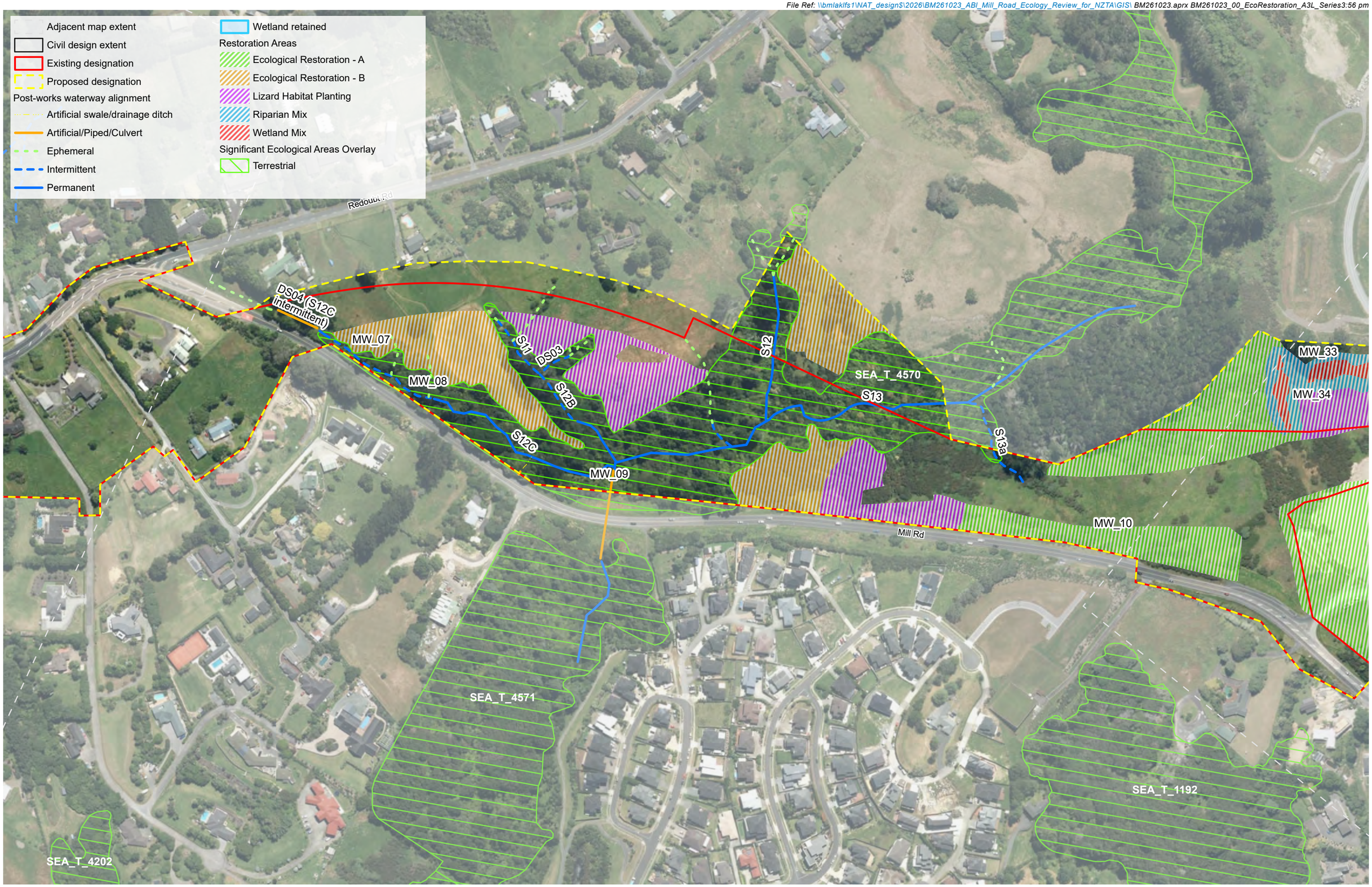
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Map 3a



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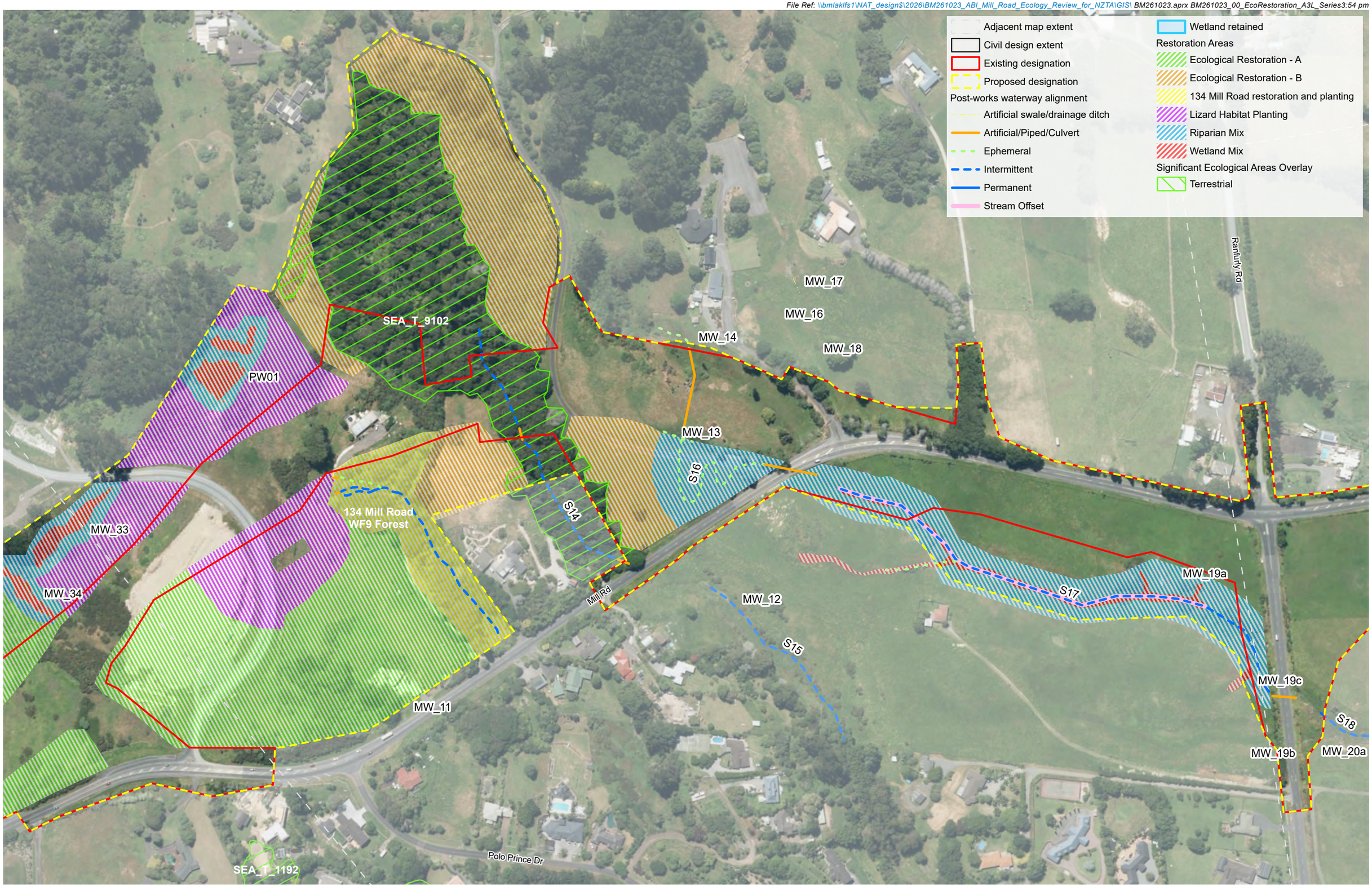
Ecological Restoration Extents

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Map 4



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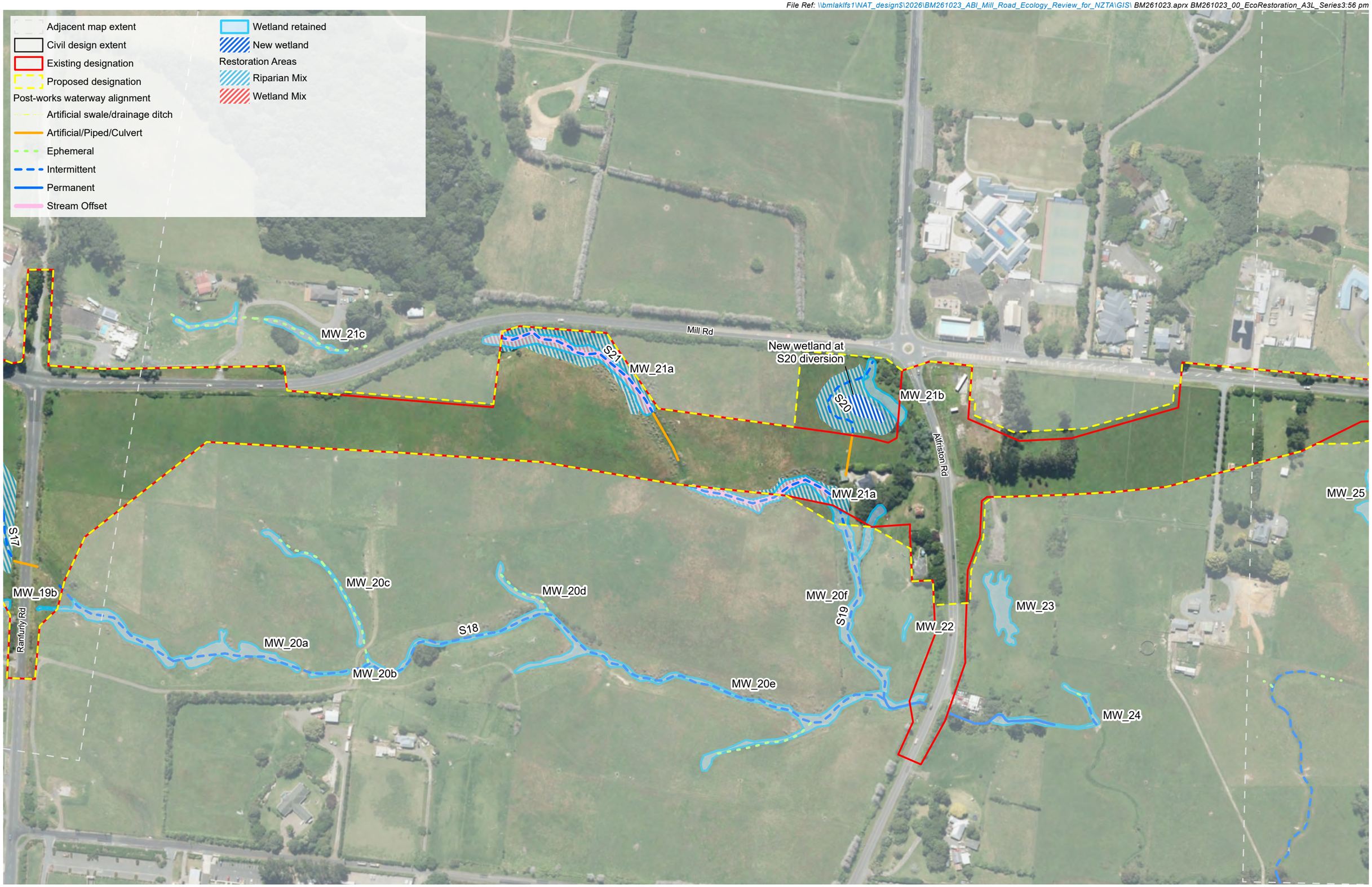
Ecological Restoration Extents

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Map 5



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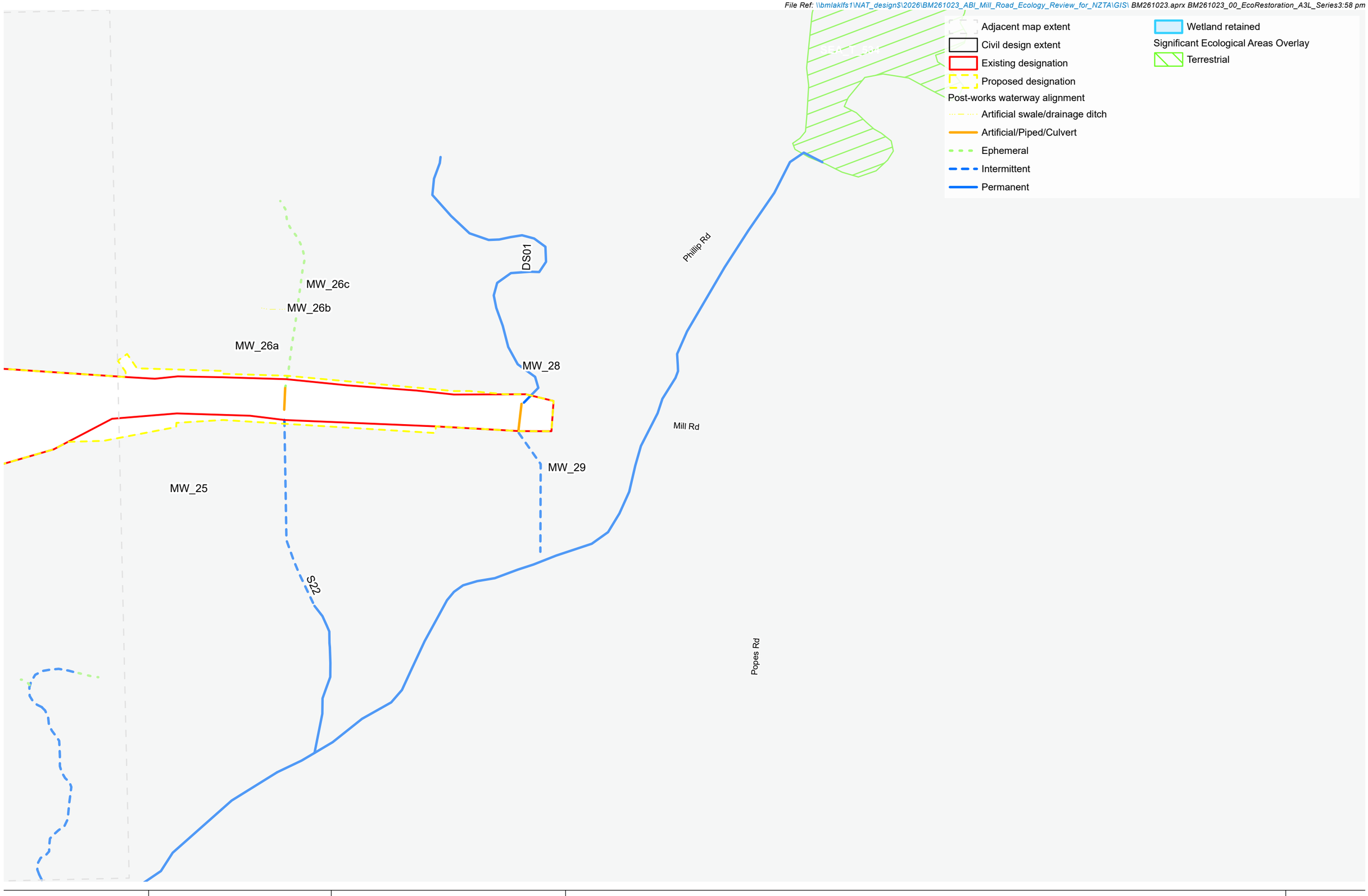
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Project Manager: s9(2)(a) | Drawn: LJa | Checked: ABI

Map 6



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Ecological Restoration Extents

Date: 08 September 2026 | Revision: 0

Plan prepared for NZTA by Boffa Miskell Limited

Project Manager: s9(2)(a) | Drawn: LJa | Checked: ABI

Map 7

APPENDIX F Previous Desktop SEA Plant Lists

Table 9-5 Summary of results of vegetation surveys/plant lists for Puhinui Gully scrub and bush, and Cheesman's Bush by Kessels et al (2008), Boffa Miskell (2014), AECOM 2020 and 2025.

Level	Kessels & Associates (2008)	Boffa Miskell (2014)	AECOM (2020)	AECOM (2025)
Puhinui Gully (SEA_T_4570)				
Overall notes	-	-	WF9 Taraire-tawa-podocarp forest. Advanced stage of forest successions – kahikatea DBH 135 cm, miro 96 cm, rewarewa 71 cm, rimu 98 cm. relict trees estimated at several hundred years old.	WF9. Recorded rimu at DBH 105 cm, matai 98.5 cm. Understorey sparse on the hilltops but denser in the gully, and as it transitions to VS5.
Canopy	Large kahikatea, taraire, rewarewa, ponga and mamaku	-	Dominated by taraire on steeper, drier terraces, kahikatea on wetter hillslopes and gully bottoms. Tawa, miro, rewarewa, pukatea, rimu	Kahikatea, taraire dominated. Matai, rewarewa, pigeonwood, pukatea, totara. Subcanopy of tree ferns. Few large exotic tree privets on western edge by Mill Road.
Understorey	Young rimu, cabbage tree, nīkau and kānuka. Seedlings of mapou and pigeonwood common.	-	Tree ferns, nīkau, hangehange, mingimingi, mamangi, and native species as in Cheesman's.	Nīkau, kanono, karaka, māhoe, hangehange, karamu, marbleleaf, five finger. Weed incursion of Chinese privet, tree privet, monkey apple, wild ginger.
Groundcover and epiphytes	Kahakaha in crowns of larger trees. Groundcover not mentioned.	-	Hairy fern, huruhuruwhenua, thread fern, hook sedge. Carmine and white rātā, kiekie, climbing fern, lance fern, drooping spleenwort, supplejack. Tradescantia, montbretia	Fern dominated – ponga, lime fern, Hound's tongue fern, sweet fern, creeping shield fern, fragrant fern. Shining spleenwort. Exotics include tradescantia, privet seedlings.
Puhinui Gully Scrub (SEA_T_4570)				
Overall	Largely weed infested especially around margins and at northern end. Classified as exotic scrub, though influences of secondary semi-coastal podocarp-broadleaved forest persist.	-	VS5 Broadleaf species scrub forest – 50-60 years old. Weed incursion on edges but limited within interior – gorse, blackberry, honeysuckle.	VS5 Broadleaf species and scrub forest. Tree ferns and kānuka locally dominant. Mature tree privet interspersed throughout bush. Very dense growth.

Level	Kessels & Associates (2008)	Boffa Miskell (2014)	AECOM (2020)	AECOM (2025)
Canopy	margins dominated by pines, Chinese privet, tree privet. Native species include puriri, mamaku, ponga	-	Māhoe, tree ferns, nīkau, exotic tree privet.	Māhoe, hangehange, kanono, tūrepo. Some younger kahikatea. Tree ferns.
Understorey	woolly nightshade, gorse, Himalayan honeysuckle, pampas. Native species kawakawa, hangehange, kanono, nīkau and mapou saplings, juvenile kiekie and NZ passionfruit	-	Majority native, kahikatea, kanono, taraire, tawa, rewarewa, tūrepo, tītoki	Kanono, marbleleaf, hangehange, kawakawa, tarata, rimu, karaka, puriri. Exotics include tree privet, Chinese privet, woolly nightshade.
Groundcover and epiphytes	wandering Jew, creeping buttercup, Kikuyu grass, lotus, black nightshade, hedge woundwort. Native species include *Carex germinate* and raupo.	-	Carmine and white rātā, kōhia, kiekie, native ferns	Native ferns and bush sedge dominant where canopy cover greater, where there are gaps in the canopy exotic herbs dominate.
Cheesman's Bush (SEA_T_9102)				
Overall	fenced off from stock >12 years. Rare examples of old growth semi-coastal podocarp-broadleaved forest with canopy height of 20-25 m. DBH of kahikatea, kohekohe, taraire = 60 cm, puriri = 124 cm, rimu = 37 cm, kānuka = 35 cm	Old growth podocarp-broadleaved forest with canopy height 18-20 m	WF9 Taraire-tawa-podocarp forest. Remnant forest, taraire DBH 130 cm (multistem), puriri DBH 160 cm. Signs of pest control	Majority WF9, with a section at northwest of bush identified to be VS5 – regenerating bush – also shows signs of more weed incursion compared to old forest.
Canopy	Taraire and puriri dominant on slopes, kahikatea on gully floor. Rimu, tanekaha, odd matai, pukatea. Ponga, wheki and mamaku. Māhoe, tawa, karaka, pigeonwood, mapou, cabbage tree, nīkau. Totara, kānuka, lancewood and tītoki on drier slopes.	Dominated by taraire and puriri. Rimu, rewarewa, karaka, pigeonwood, tawa, Tanekaha, matai. Kahikatea, nīkau, cabbage tree, pukatea on gully floor, kānuka locally dominant on steep drier slopes with totara, lancewood, tītoki. Subcanopy of mapou, māhoe, ponga, wheki, mamaku	Dominated by taraire, tawa, puriri and kahikatea common. Miro, totara, kohekohe. Subcanopy of nīkau, tree ferns, māhoe, karaka, pigeonwood	Taraire and puriri on hillslopes, kahikatea in gully. Rimu and pukatea stands on the northern end. Kohekohe, totara, matai. Eastern boundary dense subcanopy of nīkau, on western side tree ferns. Kānuka locally dominant on northwest slopes and right outside SEA boundary on east.
Understorey	Mapou, hangehange, lancewood, karamu, kanono, putaputawētā, flax. *Coprosma spathulata* and mingimingi higher up the slopes. Lacebark, kauri, Pittosporum, korokia and five-finger planted along the margins of the western gully.	Māhoe, hangehange, lancewood, karamu, kanono, putaputawētā, *Cosrosma spathulata*, mingimingi.	Regenerative canopy species, and mapou, hangehange, rangiora, kānuka, mingimingi.	Regenerating canopy species, karaka, hangehange, pigeonwood, rewarewa, māhoe, red matipo. Understorey especially sparse on the slopes on southeastern side (below mature taraire stands) mainly nīkau.

Level	Kessels & Associates (2008)	Boffa Miskell (2014)	AECOM (2020)	AECOM (2025)
Groundcover and epiphytes	NZ passionfruit, two climbing rātā species, hound's tongue fern, fragrant fern, hanging spleenwort, sickle spleenwort, filmy fern, fork fern, leather-leaf fern, kahakaha. Groundcover of native seedlings – karaka, māhoe, pigeonwood, taraire, puriri, mangeao; ferns. Bamboo grass, nertera, hookgrass. Orchids noted *Acianthus sinclairii* and bamboo orchid.	NZ passionfruit, small white rātā, pink rātā vine, hound's tongue fern, fragrant fern, hanging spleenwort, sickle spleenwort, filmy fern, fork fern, leather-leaf fern, kahakaha	Dominated by ferns – thread fern, shining spleenwort. King fern along the stream corridor. Hound's tongue fern, shining broadlead, supplejack, carmine rātā, climbing rātā, akatea.	Ferns – lance fern, thread fern, fragrant fern, lime fern, Hound's tongue fern, shield fern. Climbers include supplejack, NZ passionfruit, climbing rātā, scarlet rātā. Sickle spleenwort, shining spleenwort.

APPENDIX G Non-impacted Significant Ecological Areas

Table 9-6 Significant Ecological Areas (SEAs) not impacted by Project activities and therefore not subject to further assessment

SEA	Distance from project (km)	Relevance to project	SEA Description
SEA_T_1192	0.12	Not impacted by Project.	4.8 ha. 3c Habitat type supports typical species richness; 4c Migration pathway. Habitat comprised of WF9 Tawa, taraire and podocarp forest
SEA_T_538b	0.19	Not impacted by Project.	1.6 ha. 1a Representative of 10% natural extent within Eco District: WF7; 2a Threatened ecosystem: WF7 (1.06 ha); 4c Migration pathway
SEA_T_1191	0.22	Not impacted by Project.	2.5 ha. 1a Representative of 10% natural extent within Eco District: WF7; 2a Threatened ecosystem: WF7 Puriri forest (0.74 ha); 4c Migration pathway. Exotic dominated with scrub and forest
SEA_T_4202	0.27	Adjacent to SEA_T_4571.	36.2 ha. Greater Totara Park
SEA_T_1189B	0.29	Not impacted by Project.	4.2 ha. *2b Threatened species*: *Ptisana salicina.* Habitat comprised of WF9 Tawa, taraire and podocarp forest and VS2 Kānuka scrub/forest
SEA_T_5312	0.30	Not impacted by Project.	11.3 ha. 2b Threatened species: *Ptisana salicina* 2e Rare species: *Grammiti billardierei;* 3a Habitat diversity: WF9, VS4; 4b Buffer: Buffers a Protected Area and an SEA
SEA_T_534	0.35	Not impacted by Project.	2.0 ha. 1a Representative of 10% natural extent within Eco District: MF4 (1.47 ha), WF7 (0.45 ha); 2a Threatened ecosystem: MF4 Kahikatea forest (1.5 ha), WF7 Puriri forest; 2c LENZ LVL 4 remaining vegetation: <10% indigenous cover left; 3a Habitat diversity: MF4, WF7
SEA_T_5421	0.57	Not impacted by Project.	3.2 ha. Habitat comprised of WF9 Tawa, taraire and podocarp forest
SEA_T_5421b	0.71	Not impacted by Project.	1.1 ha. *4c Migration pathway.* Habitat comprised of WF9 Tawa, taraire and podocarp forest
SEA_T_8437	0.74	Not impacted by Project.	4.2 ha. *2a Threatened ecosystem*: MWF7 Puriri forest. Comprised of WF9 Taraire, tawa, podocarp forest and VS2 Kānuka scrub/forest
SEA_T_5282	0.75	Not impacted by Project.	13.4 ha. Murphy's Bush (west). 1a Representative of 10% natural extent within Eco District: MF4 (13 ha); 2a Threatened ecosystem: MF4 Kahikatea forest (13 ha); 2c LENZ LVL 4 remaining vegetation: <10% indigenous cover left, 10-20% left; 2e Rare species: *Libocedrus plumosa, Collospermum microspermum, Pennantia corymbosa*
SEA_T_5282a	0.75	Not impacted by Project.	7.2 ha. Murphy's Bush (east). 1a Representative of 10% natural extent within Eco District: MF4 (6.51 ha); 2a Threatened ecosystem: MF4 Kahikatea forest (7.1 ha); 2c LENZ LVL 4 remaining vegetation: <10% indigenous cover left, 10-20% left; 2e Rare species: *Libocedrus plumosa*
SEA_T_4359	0.92	Not impacted by Project.	4.6 ha. *1a Representative of 10% natural extent within Eco District:* WF9 Taraire-tawa-podocarp forest (4.09 ha); *4b Buffer*: Buffers a Protected Area
SEA_T_535	0.94	Not impacted by Project.	2.8 ha. 1a Representative of 10% natural extent within Eco District: WF7; 2a Threatened ecosystem: WF7 Puriri forest. VS2 Kānuka scrub/forest
SEA_T_8438	0.98	Not impacted by Project.	0.9 ha. *2a Threatened ecosystem*: WF7 Puriri forest. VS2 Kānuka scrub/forest
SEA_T_1188	1.16	Not impacted by Project.	87.7 ha. Habitat comprised of WF9 Tawa, taraire and podocarp forest
SEA_T_539	1.35	Not impacted by Project.	1.2 ha. 1a Representative of 10% natural extent within Eco District: WF7; 2a Threatened ecosystem: WF7 Puriri forest; 2e Rare species: *Pennantia corymbosa*

APPENDIX H Vegetation Surveys

For information on individual trees refer to the Arboricultural report (APPENDIX B).

H.1 SEA_T_538a Everglade Park

No formal vegetation surveys were conducted in Everglade Park (SEA_T_538a). The list of species observed during walkovers is presented in Table 9-7.

Table 9-7 List of vegetation species in SEA_T_538a, Everglade Park

Tier	Common name	Scientific name
Canopy / Emergent	Pūriri	Vitex lucens
	Tōtara	Podocarpus totara
	Rewarewa	Knightia excelsa
	Karaka	Corynocarpus laevigatus
Subcanopy / Small trees	Māhoe	Melicytus ramiflorus
	Mapou	Myrsine australis
	Pigeonwood	Hedycarya arborea
	Karamū	Coprosma robusta
	Karo	Pittosporum crassifolium
	Wineberry	Aristotelia serrata
	Tarata (Lemonwood)	Pittosporum eugenioides
Understorey	Kawakawa	Piper excelsum
	Tree ferns	Cyathea spp., Dicksonia squarrosa
	Ferns	Blechnum, Asplenium, Microsorum spp.
Edge / Pioneer species	Mānuka	Leptospermum scoparium
	Kānuka	Kunzea robusta
	Cabbage tree	Cordyline australis
Exotics / Weeds	Privet	Ligustrum lucidum, L. sinense
	Woolly nightshade	Solanum mauritianum
	Ginger	Hedychium gardnerianum
	Tradescantia	Tradescantia fluminensis
	Climbing asparagus	Asparagus scandens

H.2 RECCE plot survey results

Fourteen and eleven plots were done in Cheesman's Bush (SEA_T_9102) and Puhinui Gully and Scrub (SEA_T_4570) respectively. The locations of these plots are detailed in Table 9-8, Figure 9-3 and Figure 9-4. Species recorded in the SEAs are listed in Table 9-9 to Table 9-11. Puhinui Gully Bush and Scrub have greater weed invasion than Cheesman's Bush. The greater number of exotic groundcover species in Puhinui Gully Scrub can be attributed to sections along the stream where canopy cover is sparse.

Table 9-8 Locations of RECCE vegetation plots

Vegetation plot ID	Latitude	Longitude	Habitat type	Inside/Outside of designation
Cheesman's Bush, SEA_T_9102				
V_C01	-37.0058	174.9332	WF9	Outside
V_C02	-37.0054	174.9335	WF9	Outside
V_C03	-37.0048	174.9342	WF9	Inside
V_C04	-37.0042	174.9342	WF9	Outside
V_C05	-37.0043	174.9347	WF9	Outside
V_C06	-37.0032	174.9347	WF9	Outside
V_C07	-37.0034	174.9351	VS5	Outside
V_C08	-37.0031	174.9354	VS5	Outside
V_C09	-37.0036	174.936	WF9	Outside
V_C10	-37.0032	174.9365	WF9	Outside
V_C11	-37.0046	174.9344	WF9	Inside
V_C12	-37.004	174.935	WF9	Outside
V_C13	-37.0036	174.9355	WF9	Outside
V_C14	-37.0039	174.9343	WF9	Outside
Puhinui Gully, Sea_T_4570				
V_W01	-36.9988	174.9246	WF9	Inside
V_W02	-36.9996	174.9257	WF9	Inside
V_W03	-36.9992	174.9261	WF9	Inside
V_W04	-36.9996	174.9266	VS5	Inside
V_W05	-36.9998	174.9277	VS5	Outside
V_W06	-36.9992	174.9263	WF9	Inside
V_W07	-37.0001	174.9305	VS5	Outside
V_W08	-36.9988	174.9308	VS5	Outside
V_W09	-36.9974	174.9315	VS5	Outside
V_W10	-36.9969	174.9319	VS5	Outside
V_W11	-36.9995	174.9264	WF9	Inside

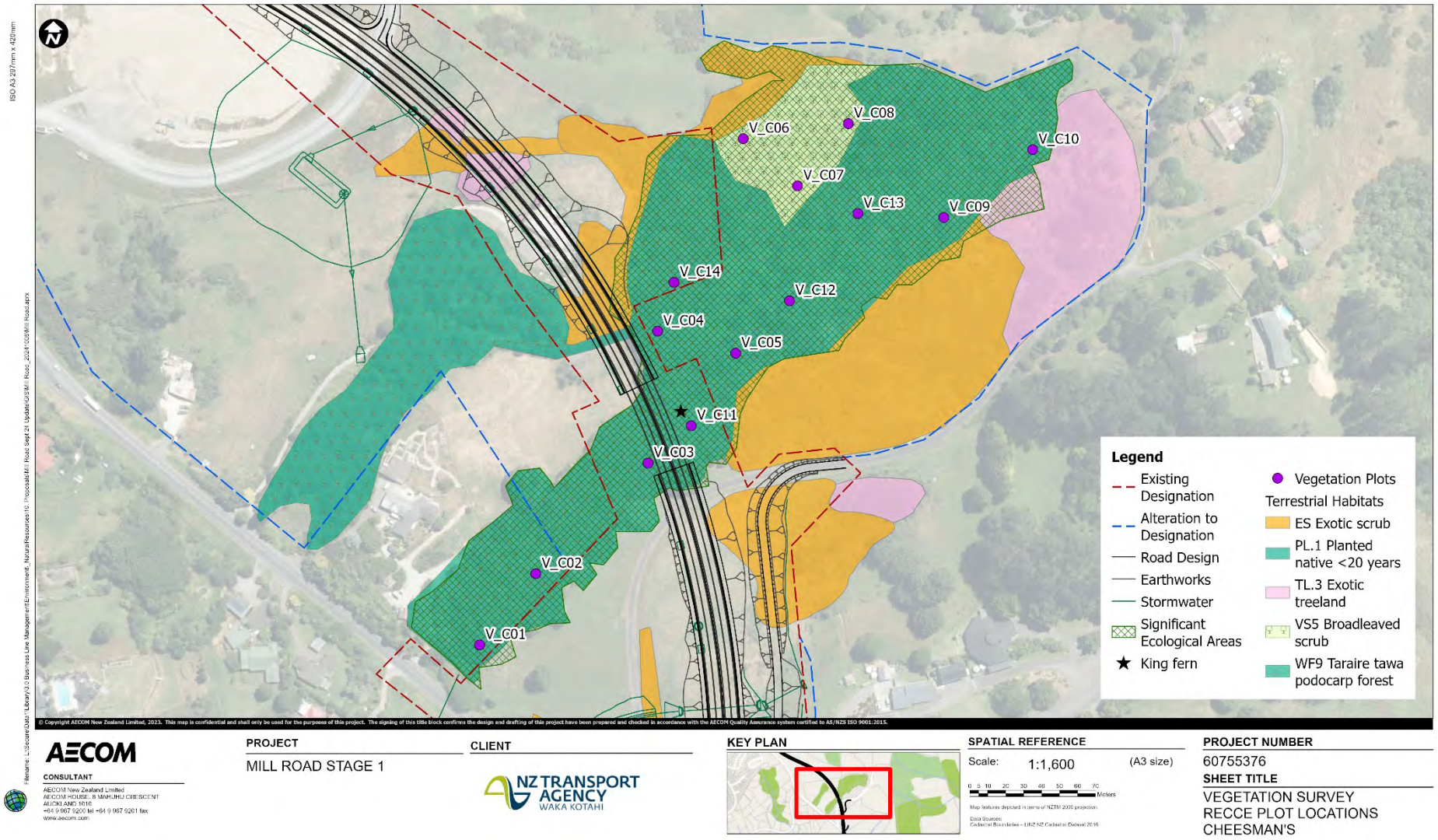
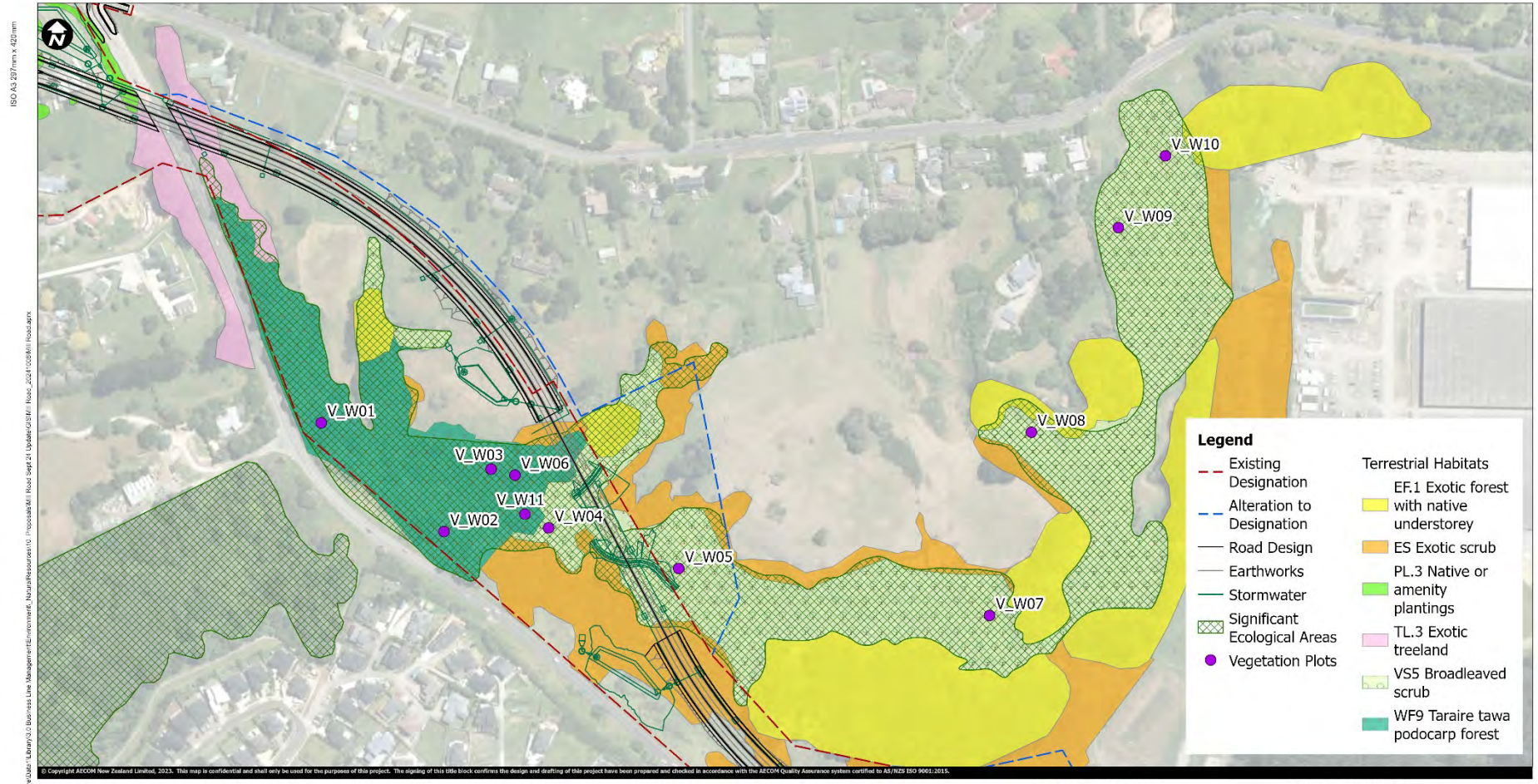


Figure 9-3: Vegetation plot locations at Cheesman's Bush (SEA_T_9102)



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PROJECT

MILL ROAD STAGE 1

CLIENT

NZ TRANSPORT AGENCY WAKA KOTAHI

KEY PLAN

SPATIAL REFERENCE

Scale: 1:2,400 (A3 size)

0 10 20 40 60 80 100 120 140 Meters

Map features depicted in terms of NZTM 2000 projection

Data Sources:
Cadastral Boundaries – LINZ NZ Cadastral Dataset 2016

PROJECT NUMBER

60755376

SHEET TITLE

VEGETATION SURVEY
RECCE PLOT LOCATIONS
WATERCARE

Figure 9-4: Vegetation plot locations at Puhinui Gully (SEA_T_5470)

Table 9-9 List of tree (DBH >2.5 cm, and height >135 cm) species recorded in each SEA.

Scientific name	Common name	Cheesman's Bush	Puhinui Gully Bush	Puhinui Gully Scrub
Native species				
Beilschmiedia tarairi	Taraire	X	X	
Beilschmiedia tawa	Tawa	X		
Carpodetus serratus	Marbleleaf		X	
Coprosma arborea	Mamangi		X	
Coprosma grandifolia	Kanono		X	X
Coprosma robusta	Karamu		X	X
Cordyline australis	Tī kōuka / cabbage tree	X	X	
Corynocarpus laevigatus	Karaka	X		
Dacrydium cupressinum	Rimu		X	
Dacrycarpus dacrydioides	Kahikatea	X	X	X
Didymocheton spectabilis	Kohekohe	X		
Fuscospora truncata	Tawhairaunui / hard beech	X		
Geniostoma ligustrifolium	Hangehange	X	X	X
Hedycarya arborea	Pigeonwood	X	X	
Knightia excelsa	Rewarewa		X	
Kunzea robusta	Kānuka	X		X
Laurelia novae-zelandiae	Pukatea	X	X	
Melicytus ramiflorustus	Māhoe	X	X	X
Myrsine australis	Red matipo	X	X	X
Nestegis lanceolata	White maire	X		
Phylocladus trichomanoides	Tanekaha	X		
Piper excelsum	Kawakawa	X		X
Pittosporum crassifolium	Karo	X		
Pittosporum tenuifolium	Kōhūhū	X		
Podocarpus totara	Tōtara	X	X	
Prumnopitys taxifolia	Mataī	X	X	
Schefflera digitata	Patē / seven-finger	X		X
Streblus heterophyllus	Small leaved milk tree/tūrepo	X		X
Vitex lucens	Puriri	X		
Exotic species				
Ligustrum lucidum	Tree privet		X	X
Ligustrum vulgare	English privet	X		X
Solanum mauritianum	Woolly nightshade			X
Syzygium smithii	Monkey-apple	X	X	
Ulex europaeus	Gorse	X		

Table 9-10 List of sapling (DBH <2.5 cm, and height >135 cm) species recorded in each SEA.

Scientific name	Common name	Cheesman's Bush	Puhinui Gully Bush	Puhinui Gully Scrub
Native species				
Brachyglottis repanda	Rangiora		X	X
Carpodetus serratus	Marbleleaf		X	
Coprosma arborea	Mamangi		X	
Coprosma grandifolia	Kanono		X	X
Coprosma robusta	Karamu		X	X
Coprosma spathulata	-		X	
Corynocarpus laevigatus	Karaka	X	X	X
Dacrydium cupressinum	Rimu			X
Dacrycarpus dacrydioides	Kahikatea		X	X
Didymocheton spectabilis	Kohekohe	X		
Geniostoma ligustrifolium	Hangehange	X	X	X
Hedycarya arborea	Pigeonwood	X	X	
Knightia excelsa	Rewarewa	X		
Laurelia novae-zelandiae	Pukatea	X		
Melicytus ramiflorustus	Māhoe	X	X	X
Myrsine australis	Red matipo	X	X	X
Piper excelsum	Kawakawa	X		X
Pittosporum eugenioides	Tarata			X
Podocarpus totara	Tōtara	X		X
Pseudopanax arboreus	Five finger		X	
Pseudopanax crassifolius	Horoeka / lancewood	X		
Schefflera digitata	Patē / seven-finger	X	X	X
Streblus heterophyllus	Small leaved milk tree/tūrepo		X	X
Exotic species				
Ligustrum lucidum	Tree privet		X	X
Ligustrum sinense	Chinese privet			X
Prunus serrulata	Japanese cherry		X	
Solanum mauritianum	Woolly nightshade		X	X
Syzygium smithii	Monkey-apple	X	X	

Table 9-11 List of groundcover and seedling (DBH <2.5 cm, and height <135 cm) species recorded in each SEA.

Scientific name	Common name	Cheesman's Bush	Puhinui Gully Bush	Puhinui Gully Scrub
Native species				
Alsophila tricolor	Silver fern	X	X	X
Asplenium bulbiferum	Hen and chicken fern		X	
Asplenium lamprophyllum	-	X		
Asplenium oblongifolium	Shining spleenwort		X	

Scientific name	Common name	Cheesman's Bush	Puhinui Gully Bush	Puhinui Gully Scrub
Asplenium polyodon	Sickle spleenwort	"	X	X
Beilschmiedia tarairi	Taraire	X		
Beilschmiedia tawa	Tawa	X		
Austroblechnum lanceolatum	Lance fern	X		X
Icarus filiformis	Thread fern	X	X	
Austroblechnum membranaceum	-	X		
Brachyglottis repanda	Rangiora		X	
Carex dissita	Forest sedge	X	X	X
Coprosma arborea	Mamangi		X	
Coprosma grandifolia	Kanono	X	X	X
Coprosma robusta	Karamu	X		X
Coprosma spathulata	0		X	
Corynocarpus laevigatus	Karaka	X	X	
Dacrycarpus dacrydioides	Kahikatea	X	X	X
Didymocheton spectabilis	Kohekohe	X		
Geniostoma ligustrifolium	Hangehange	X	X	X
Hedycarya arborea	Pigeonwood	X	X	
Knightia excelsa	Rewarewa	X	X	
Lastreopsis hispida	Hairy fern	X	X	
Laurelia novae-zelandiae	Pukatea	X		
Melicytus ramiflorustus	Māhoe	X	X	X
Metrosideros perforata	Akatea/ white climbing rata		X	
Dendroconche scandens	Fragrant fern	X	X	
Myrsine australis	Red matipo	X	X	X
Oplismenus hirtellus subsp. imbecillis	Basket grass	X	X	X
Pakau pennigera	Gully/lime fern	X		X
Parapolystichum microsorum	Creeping shield fern		X	
Zealandia pustulata subsp. pustulata	Hound's tongue	X	X	X
Phylocladus trichomanoides	Tanekaha	X		
Piper excelsum	Kawakawa	X		
Podocarpus totara	Tōtara	X		
Polystichum vestitum	Shield fern	X	X	X
Pseudopanax arboreus	Five finger	X	X	
Pseudopanax lessonii	Houpara	X		
Pteris macilenta	Sweet fern	X	X	

Scientific name	Common name	Cheesman's Bush	Puhinui Gully Bush	Puhinui Gully Scrub
Pteris tremula	Shaking brake	X		
Rhopalostylis sapida	Nīkau	X	X	X
Ripogonum scandens	Supplejack	X		X
Schefflera digitata	Patē / seven-finger	X	X	X
Sphaeropteris medullaris	Mamaku / black tree fern	X		X
Streblus heterophyllus	Small leaved milk tree/tūrepo	X		X
Vitex lucens	Puriri	X	X	X
Exotic species				
Alocasia brisbanensis	Elephant's ears	X		
Archontophoenix cunninghamiana	Bungalow palm			X
Cenchrus clandestinus	Kikuyu			X
Elytrigia repens	Couch grass	X		
Hedychium gardnerianum	Wild ginger			X
Holcus lanatus	Yorkshire fog			X
Leycesteria formosa	Himalayan honeysuckle			X
Ligustrum lucidum	Tree privet	X	X	X
Ligustrum sinense	Chinese privet			X
Lotus corniculatus	Birdsfoot trefoil			X
Microlaena avenacea	Bush rice grass	X		
Prunus serrulata	Japanese cherry		X	
Ranunculus repens	Buttercup			X
Stachys sylvatica	Hedge woundwort			X
Tradescantia fluminensis	Tradescantia			X

The groundcover composition is an average of the results of the four 2mx2m subplots within each plot and detailed in Table 9-12. Within Cheesman's Bush leaf litter was the highest groundcover due to the number of significant trees and their lead litter smothering seedlings.

Table 9-12 Average groundcover in each plot

Plot	Habitat classification	Groundcover average %						
		Bare earth	Rock	Live wood	Dead wood	Leaf litter	Vegetation	Moss
Cheesman's Bush, SEA_T_9102								
V_C01	WF9	8.5	0	15	7.5	48.75	15.25	5
V_C02	WF9	0	0	6.75	8.5	40.25	44.5	0
V_C03	WF9	4	0	10.25	1	61.75	23	0
V_C04	WF9	1.75	0	6.75	3.25	67.75	21.75	0
V_C05	WF9	1.25	0	9	16.25	59	14.5	0
V_C09	WF9	2.5	0	11	11.5	47.5	27.5	0
V_C10	WF9	5.75	0	11.25	16.25	50.25	16	0.5
V_C11	WF9	2	0	9.75	5.75	80	0.75	1.75
V_C12	WF9	25	6.25	6.25	11.75	24.25	24.5	2
V_C13	WF9	3.75	0	13.75	2.5	68.75	11.25	0
V_C14	WF9	3.75	0	6.25	15	67.5	5	2.5
V_C06	VS5	1.75	0	8.25	12.5	36.25	41.25	0
V_C07	VS5	2.75	0	13	6.25	48.75	29.25	0
V_C08	VS5	1.5	0	6.25	6.75	57.25	27	1.25
Puhinui Gully Bush and Scrub, SEA_T_4570								
V_W01	WF9	4.75	0	5.75	5	56.75	25.5	2.25
V_W02	WF9	13.5	0	7.5	9.75	54.75	13.75	0.75
V_W03	WF9	4.25	0	14.5	2.5	7.5	71.25	0
V_W06	WF9	5	0	8.75	11.25	43.75	25	6.25
V_W11	WF9	2	0	8.25	5.5	43.75	38.25	2.25
V_W04	VS5	12	0	10	6.25	20	42.25	9.5
V_W05	VS5	5.25	0	7.25	5.5	48.25	35	2.5
V_W07	VS5	8.25	0	9.5	9.25	40	30	3
V_W08	VS5	1.25	0	8.25	5	76.5	9	0
V_W09	VS5	4	0	11.75	15.75	53.75	13	1.75
V_W10	VS5	10	0	2.5	1.25	30.75	53.75	1.75

Table 9-13 RECCE plot summary data

Plot number	Habitat classification	Within/ outside impact footprint	No. Native species	No. Exotic species	Species Richness (total)	Dominant Canopy Species	Understorey Composition	Notes (e.g., weed invasion, regeneration)
Cheesman's Bush, SEA_T_9102								
V_C01	WF9	Outside	11	0	11	Tōtara, puriri	Quite bare. young māhoe tree, red matipo and nikau saplings	High leaf litter. Tōtara (DBH 109.5)
V_C02	WF9	Outside	12	2	14	Puriri, kahikatea (outside of plot)	Fairly bare, māhoe, red matipo	Grass cover, gaps in canopy. Puriri (DBH 97)
V_C03	WF9	Inside	12	0	12	Tanekaha	Tree ferns, nikau saplings	
V_C04	WF9	Outside	12	0	12	Taraire	Fairly bare, young kahikatea trees	
V_C05	WF9	Outside	7	0	7	Karaka, kahikatea	Nikau dominated	
V_C06	VS5	Outside	11	4	15	Kānuka	Fairly bare, some regenerating broadleaf scrub species - Kōhūhū, karaka, red matipo etc.	some gorse invasion, grass cover
V_C07	VS5	Outside	15	1	16	Tree ferns, red matipo	Hangehange dominated, māhoe, nikau	few monkey apple saplings, some kahikatea seedlings
V_C08	VS5	Outside	12	0	12	Large pukatea outside of plot but dominates canopy	Fairly bare, nikau dominated, māhoe	
V_C09	WF9	Outside	20	0	20	Pukatea, nikau	Nikau dominated	
V_C10	WF9	Outside	16	0	16	Tōtara, māhoe	Māhoe, supplejack, nikau	
V_C11	WF9	Inside	7	0	7	Taraire	Quite bare. Kohekohe, nikau	Taraire leaves smothering seedlings
V_C12	WF9	Outside	9	1	10	Nikau	Māhoe, nikau, ground ferns	

Plot number	Habitat classification	Within/ outside impact footprint	No. Native species	No. Exotic species	Species Richness (total)	Dominant Canopy Species	Understorey Composition	Notes (e.g., weed invasion, regeneration)
V_C13	WF9	Outside	11	0	11	Pukatea	Nikau, ground ferns, lots of seedlings (karaka, hangehange, māhoe)	
V_C14	WF9	Outside	10	1	11	Taraire, pukatea	Fairly bare. nikau, tree ferns	
Puhinui Gully, SEA_T_4570								
V_W01	WF9	Inside	13	2	15	Tree privet, tree ferns. Kahikatea (outside of plot)	Māhoe, hangehange, nikau	Several tree privets (DBH 30-40 cm) but no saplings or seedlings, rewarewa seedlings
V_W02	WF9	Inside	16	1	17	Pigeonwood	hangehange saplings, nikau	
V_W03	WF9	Inside	18	3	21	Tōtara	Very dense understorey. hangehange saplings, monkey apple	Tree privet and monkey apple invasion. One kahikatea sapling
V_W04	VS5	Inside	15	9	24	Mamaku	Very dense understorey. Māhoe, hangehange, kanono, kahikatea.	High number of saplings
V_W05	VS5	Outside	10	1	11	Māhoe	Fairly bare. Tree ferns	Tree privet seedlings. Several multi-stem māhoe
V_W06	WF9	Inside	17	1	18	Rimu, matai	Fairly bare. Māhoe, tree ferns	Rimu (DBH 105), matai (DBH 98.5)
V_W07	VS5	Outside	9	3	12	Māhoe, tree ferns	Fairly dense. hangehange, kanono	Woolly nightshade saplings present
V_W08	VS5	Outside	7	0	7	Ponga	Very dense. Kānuka, tree ferns, hangehange	High number of dead kānuka stands, dead gorse. Few kahikatea seedlings.
V_W09	VS5	Outside	6	2	8	Tree ferns	Māhoe, hangehange,	Tree privet invasion

Plot number	Habitat classification	Within/ outside impact footprint	No. Native species	No. Exotic species	Species Richness (total)	Dominant Canopy Species	Understorey Composition	Notes (e.g., weed invasion, regeneration)
V_W10	VS5	Outside	12	5	17	Māhoe	Fairly dense. hangehange, kanono	Domestic dog trampled through while on site, likely common occurrence due to proximity to residences
V_W11	WF9	Inside	20	2	22	Kahikatea, rewarewa, mataī	Very dense. hangehange, māhoe, kanono	Tree privet invasion

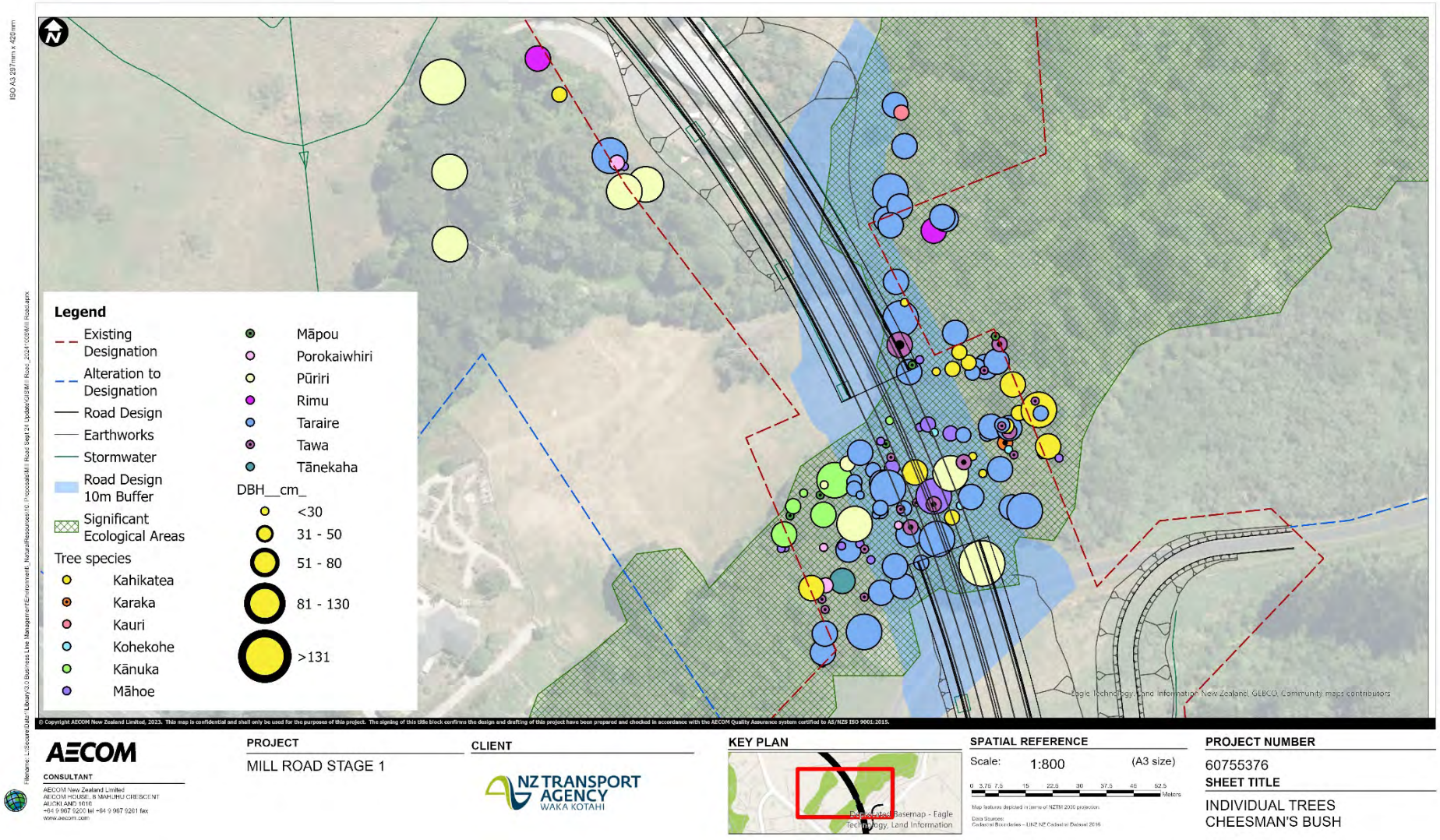


Figure 9-5: Native trees by species and size in Cheesman's Bush

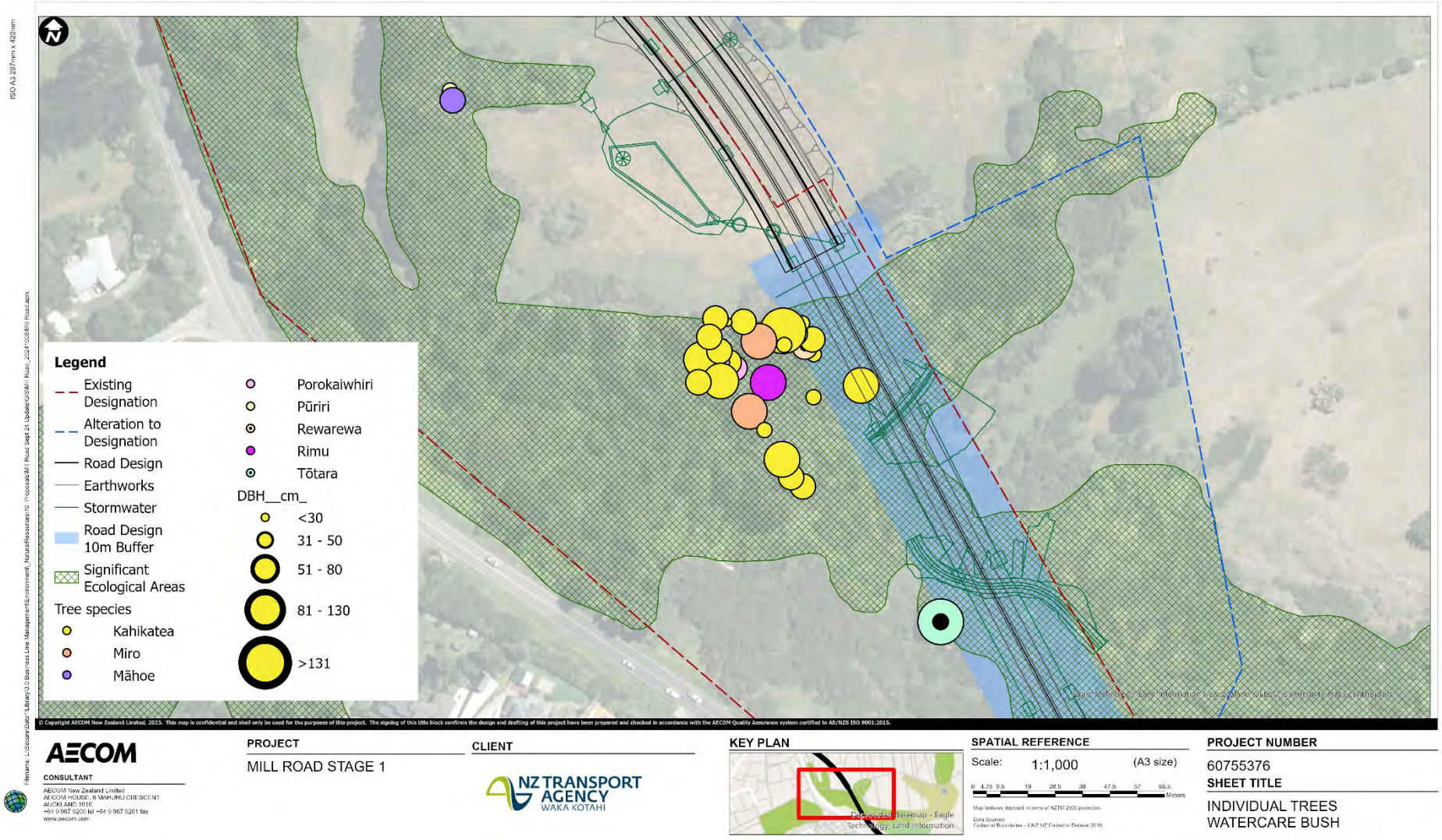


Figure 9-6: Native trees by species and size in Puhinui Gully Bush

APPENDIX I Bat Surveys

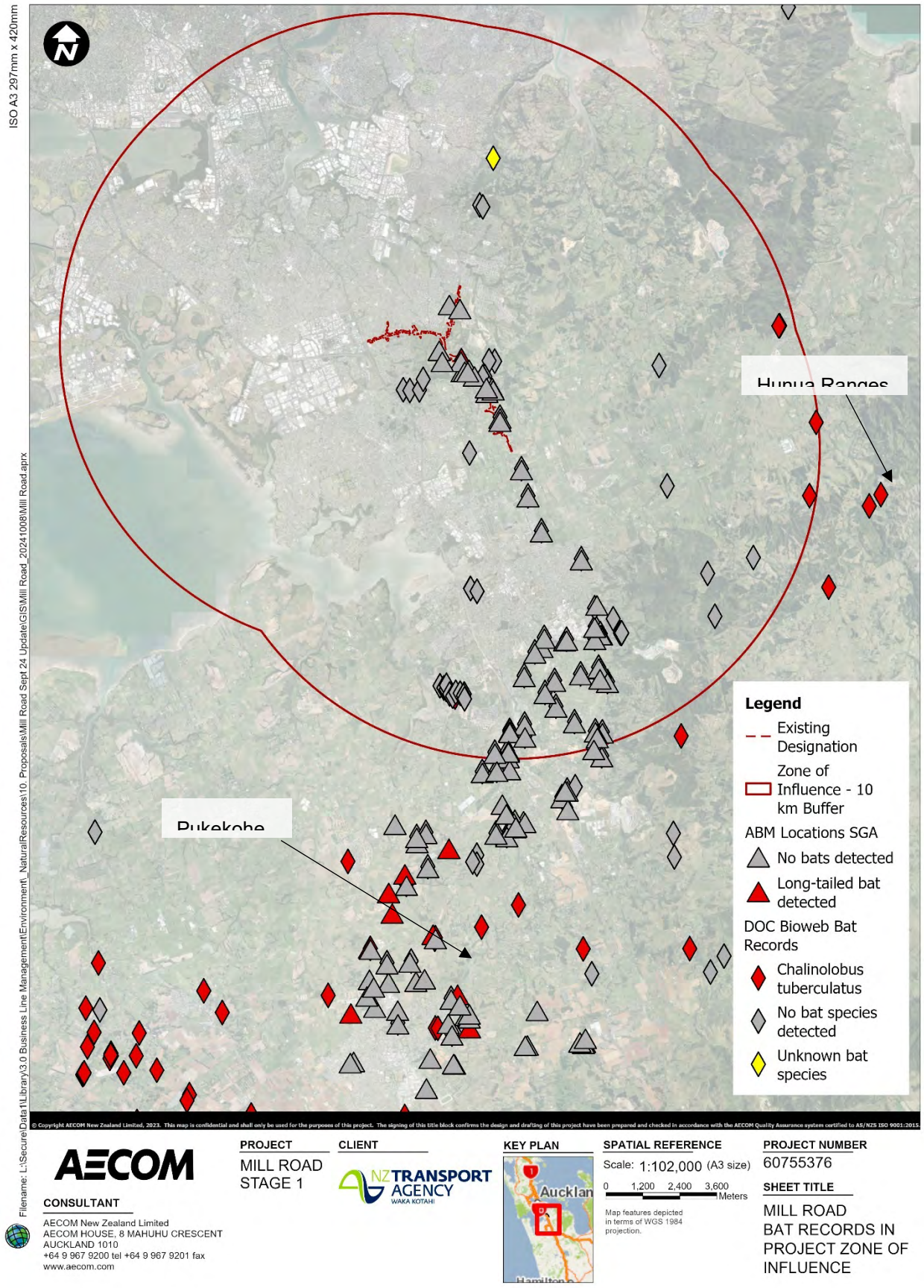


Figure 9-7: Historical bat records in the wider area

Table 9-14 Summary of bat surveys within 10 km of the Mill Road designation

Surveyor/Record source	Distance from Project	Year	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
DOC Bioweb 353 Redoubt Road	0 km – within Project Footprint	2014	-	-	-	-	-	-	-	-	✓	-	-	-
DOC Bioweb (doccm-2906042) Clevedon Scenic Reserve	approx. 9-10km from Mill Road designation with limited habitat connectivity	2014	-	-	-	-	-	-	-	-	-	✓	-	-
Boffa Miskell Mill Road Assessment of Ecological Impacts	0 km – within Project Footprint	2014	-	-	-	-	-	-	-	-	-	-	x	-
DOC Bioweb (Kessels & Associates) Drury Creek Island Recreation Reserve	approx. 9-10km from Mill Road designation with limited habitat connectivity	2017	-	-	-	-	-	-	✓	-	-	-	-	-
DOC Bioweb (Kessels & Associates) Drury Creek Island Recreation Reserve	approx. 9-10km from Mill Road designation with limited habitat connectivity	2018	-	-	-	-	-	-	✓	-	-	-	-	-

Surveyor/Record source	Distance from Project	Year	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
SGA (SGA/AECOM) South wide	>8 km from Mill Road designation	2019	-	-	-	-	-	-	x	-	-	-	-	-
SGA (SGA/AECOM) South wide	>8 km from Mill Road designation	2020	-	-	-	-	-	-	-	x	x	x	-	-
SGA (SGA/AECOM) Mill Road	0 km – within Project Footprint	2020	-	-	-	-	-	x	x	-	-	-	-	-
DOC Bioweb (EcoQuest) Hunua Clevedon (approx. 9-10km from Mill Road designation with limited habitat connectivity)	approx. 9-10km from Mill Road designation with limited habitat connectivity	2022	-	-	-	-	-	-	-	-	-	✓	-	-
DOC Bioweb (EcoQuest) Clevedon Scenic Reserve (approx. 9-10km from Mill Road designation	approx. 9-10km from Mill Road designation with limited habitat connectivity	2022	-	-	-	-	-	-	-	-	-	✓	-	-

Surveyor/Record source	Distance from Project	Year	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
with limited habitat connectivity)														
AECOM Mill Road	0 km – within Project Footprint	2024	-	-	-	-	-	-	X	-	-	-	-	-
AECOM Mill Road	0 km – within Project Footprint	2025	-	-	-	-	-	-	-	X	X	-	X	X

X = Survey completed; no bats detected. ✓ = Survey completed; bat(s) detected. - = No survey.

Table 9-15 ABM locations (WGS) during the 2024/2025 Mill Road ABM surveys

ABM ID	Latitude	Longitude	Survey Period	Bats found
X1	-37.004318	174.934956	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
X2	-37.004986	174.935385	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
X3	-37.001029	174.928735	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
X4	-36.996813	174.917064	12 Dec – 3 Feb 2025	No
X5	-37.014435	174.938239	12 Dec – 3 Feb 2025	No
X6	-37.004023	174.933068	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
X7	-36.999736	174.924758	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
X8	-36.99979	174.925967	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
B1	-36.993796	174.915434	12 Dec – 3 Feb 2025	No
B2	-36.999875	174.923934	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
B3	-36.999308	174.926488	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
B4	-37.003348	174.933351	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
BX1	-36.996763	174.923215	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No
BX2	-37.005801	174.933282	12 Dec – 3 Feb 2025 10 Apr – 2 May 2025	No

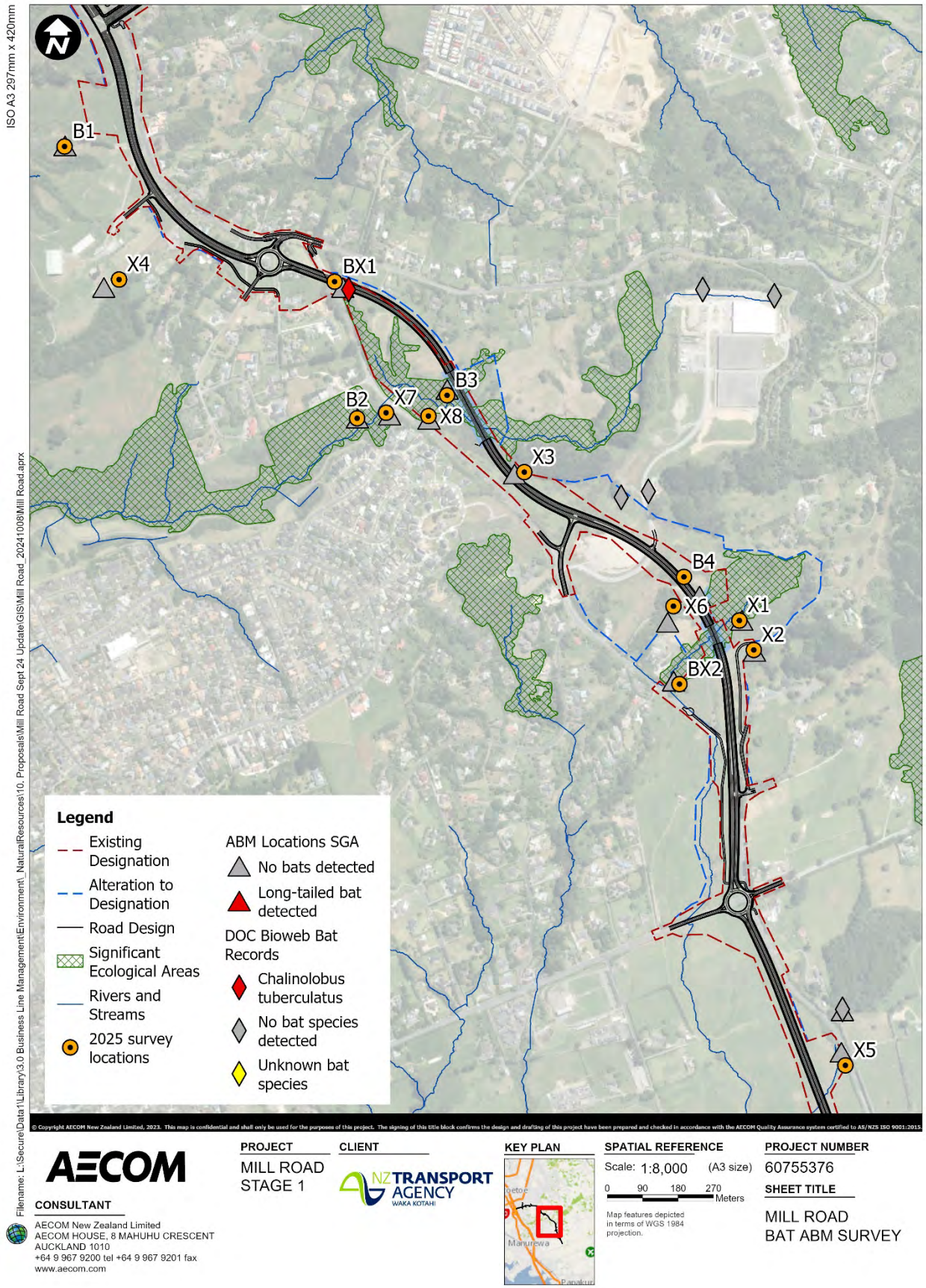


Figure 9-8: ABM locations for the 2024-2025 surveys

APPENDIX J Desktop Bird List

Table 9-16 – Desktop and survey bird records within 5 km of the Project Area

Common name	Scientific name	National conservation status (Robertson et al., 2021)	Regional conservation status (Woolly et al., 2024)	Record source
Caspian Tern/ Taranui	Hydroprogne caspia	Threatened – Nationally Vulnerable	Threatened – Regionally Critical	eBird
Grey duck	Anas superciliosa	Threatened – Nationally Vulnerable	Threatened – Regionally Critical	eBird
New Zealand dabchick	Poliocephalus rufopectus	Threatened – Nationally Increasing	Threatened – Regionally Critical	eBird, iNaturalist
Black shag | Māpunga	Phalacrocorax carbo	At Risk – Relict	Threatened – Regionally Critical	eBird
Long-tailed cuckoo | Koekoeā	Eudynamys taitensis	Threatened – Nationally Vulnerable	Threatened – Regionally Endangered	iNaturalist
Brown teal | Pāteke	Anas chlorotis	Threatened – Nationally Increasing	Threatened – Regionally Endangered	eBird
Black-billed gull/ Tarāpuka	Larus bulleri	At Risk – Declining	Threatened – Regionally Endangered	eBird
Little shag	Microcarbo melanoleucos brevirostris	At Risk – Relict	Threatened – Regionally Endangered	eBird, iNaturalist
New Zealand Pipit	Anthus novaeseelandiae	At Risk – Declining	Threatened – Regionally Vulnerable	eBird
Red-billed gull | Tarāpunga	Chroicocephalus novaehollandiae	At Risk – Declining	Threatened – Regionally Vulnerable	eBird, iNaturalist
Variable oystercatcher/ Tōrea pango	Haematopus unicolor	At Risk – Recovering	Threatened – Regionally Vulnerable	eBird
Bush falcon | Kārearea	Falco novaeseelandiae ferox	Threatened – Nationally Increasing	Non-Resident Native – Regional Vagrant	iNaturalist
South Island Pied Oystercatcher	Haematopus finschi	At Risk – Declining	At Risk – Regionally Declining	eBird
Little black shag/ Kawau Tūī	Phalacrocorax sulcirostris	At Risk – Naturally Uncommon	At Risk – Regionally Naturally Uncommon	eBird, iNaturalist
New Zealand kākā	Nestor meridionalis septentrionalis	At Risk – Recovering	At Risk – Regionally Recovering	eBird, iNaturalist
Pied shag | Kāruhiruhi	Phalacrocorax varius	At Risk – Recovering	At Risk – Regionally Recovering	eBird
Black swan	Cygnus atratus	Not Threatened	Regionally Not Threatened	eBird
Fantail | Pīwakawaka	Rhipidura fuliginosa	Not Threatened	Regionally Not Threatened	eBird, 5MBC, incidental
Grey warbler | Riroriro	Gerygone igata	Not Threatened	Regionally Not Threatened	eBird, 5MBC, incidental
Kererū	Hemiphaga novaeseelandiae	Not Threatened	Regionally Not Threatened	eBird, iNaturalist, 5MBC, incidental
Morepork | Ruru	Ninox novaeseelandiae	Not Threatened	Regionally Not Threatened	eBird, incidental

Common name	Scientific name	National conservation status (Robertson et al., 2021)	Regional conservation status (Woolly et al., 2024)	Record source
New Zealand scaup | Pāpango	Aythya novaeseelandiae	Not Threatened	Regionally Not Threatened	eBird
Paradise shelduck	Tadorna variegata	Not Threatened	Regionally Not Threatened	eBird, iNaturalist
Pūkeko	Porphyrio melanotus	Not Threatened	Regionally Not Threatened	eBird, iNaturalist, incidental
Sacred kingfisher | Kōtare	Todiramphus sanctus	Not Threatened	Regionally Not Threatened	eBird, iNaturalist, 5MBC, incidental
Shining cuckoo | Pīpīwharauroa	Chrysococcyx lucidus	Not Threatened	Regionally Not Threatened	eBird, 5MBC, incidental
Silvereye | Tauhou	Zosterops lateralis	Not Threatened	Regionally Not Threatened	eBird, iNaturalist, incidental
Southern black-backed gull	Larus dominicanus	Not Threatened	Regionally Not Threatened	eBird, iNaturalist
Spur-winged plover	Vanellus miles novaehollandiae	Not Threatened	Regionally Not Threatened	eBird
Swamp harrier | Kāhu	Circus approximans	Not Threatened	Regionally Not Threatened	eBird, iNaturalist, 5MBC, incidental
Tūī	Prosthemadera novaeseelandiae	Not Threatened	Regionally Not Threatened	eBird, incidental
Welcome swallow | Warou	Hirundo neoxena	Not Threatened	Regionally Not Threatened	eBird, iNaturalist
White-faced heron	Egretta novaehollandiae	Not Threatened	Regionally Not Threatened	eBird, iNaturalist

APPENDIX K Terrestrial BCM

K.1 Background

As set out in Section 5.4 the Project activities are expected to result in residual adverse effects through the permanent loss or modification of approximately 1.33 ha of vegetation and habitat (refer APPENDIX E).

The effects are predominately the permanent loss and modification of indigenous vegetation dominated by WF9 taraire, tawa, podocarp forest and VS5 broadleaved scrub/forest, including mature and old-growth forest components, significant native trees, threatened and at-risk flora, and habitat for indigenous fauna. Residual effects also include the loss and modification of habitat for copper skink and other potentially present native lizard species, together with the risk of salvage-related mortality and a reduction in the availability of established habitat features. Despite design refinements and the application of avoidance, minimisation and remediation measures, these effects cannot be fully avoided due to the permanent nature of some vegetation loss and the long timeframes required for replacement habitats to develop equivalent ecological attributes. Accordingly, the remaining residual effects have been assessed and addressed through a combination of ecological compensation measures.

Ecological values, including fauna habitat and forest function, have been addressed through a Biodiversity Compensation Model (BCM). The proposed compensation areas are located around and between Cheesman's Bush and Puhinui Gully and are selected based on ecological suitability, proximity to impacted areas, and potential for restoration and enhancement.

K.2 Scope

This BCM outlines the compensation strategy for the unavoidable loss of SEA forest and fauna habitat. The BCM is used as a decision support tool to determine the type and magnitude of biodiversity compensation required to address residual adverse effects, where those effects cannot be avoided, remedied, mitigated, or demonstrably offset.

The BCM does not demonstrate or target Net Gain outcomes, as Net Gain is an offset standard that requires quantified, like-for-like biodiversity gains to equal or exceed losses. Instead, the BCM evaluates compensation gains, which may improve ecological condition and support long-term recovery, but do not eliminate the residual loss.

The Proposed Residual Effects Management Package incorporates 15.54 ha of restoration planting, and the restoration and enrichment planting of 1.05 ha of existing WF9 forest , and the pest plant control and enhancement planting of Cheesman's bush (SEA_T_9102) and Puhinui Gully (SEA_T_4570) within the Proposed Designation. The period of implementation and monitoring is 10 years. Full details of the BCM inputs and outputs are provided in Table 9-19 to Table 9-22 below.

K.3 Biodiversity Compensation Modelling (BCM) approach

K.3.1 Overview

The BCM approach is used where it is not possible to reliably demonstrate that residual effects can be fully offset using quantitative biodiversity offset calculations. This is typically the case for resource consent and plan change processes, where assessments are necessarily based on predicted future outcomes rather than measured post-implementation results (Baber, Christensen, et al., 2021; Baber, Dickson, et al., 2021a, 2021b). Accordingly, the BCM provides a structured framework for assessing whether

proposed compensation measures are likely to appropriately address residual ecological effects (Baber, Christensen, et al., 2021; Baber, Dickson, et al., 2021).

The BCM quantifies the relative biodiversity value of affected habitats and species by assigning biodiversity value scores before and after Project impacts, and before and after implementation of compensation measures. These scores are informed by site-specific ecological surveys, relevant scientific literature, and professional ecological judgement.

The methodology applied in this assessment follows the Biodiversity Compensation Model User Guide developed by Tonkin & Taylor Ltd (Baber, Dickson, et al., 2021).

K.3.2 Advantages of BCMs

Historically, biodiversity compensation for resource consent and plan change applications has often relied on professional judgement, sometimes supported by compensation ratios or multipliers. While these approaches remain useful, they can be difficult to apply consistently and transparently. The BCM provides a more structured and repeatable framework for determining the scale of compensation required to address residual ecological effects. It is designed to achieve outcomes that are as close as practicable to biodiversity offsetting and is consistent with the concept of biodiversity compensation described in the National Policy Statement for Indigenous Biodiversity (NPSIB) (Ministry for the Environment, 2023).

K.3.3 Model limitations

In applying any biodiversity offset or compensation model, it is important to acknowledge the limitations, constraints and uncertainties associated with such models (Maseyk et al., 2018). Notably for BCMs, these limitations, constraints, and uncertainties have the potential to generate false positives, i.e., instances where the models generate Net Gain outcomes when the converse is true (Baber, Christensen, et al., 2021). Model inputs are therefore conservative to minimise this risk, and Net Gain target outcomes are also conservative, equating to a target of 10% exceedance of No Net Loss.

It is also important to recognise that as described in Section K.3.2 above, this approach is robust, provides transparency and a validation process for determining compensation requirements to address residual adverse effects.

K.4 Terrestrial Biodiversity Compensation

K.4.1 SEA Biodiversity - Overview of residual effects

The Project activities are expected to result in residual adverse effects on SEA forest habitat. These effects include the permanent loss of mature forest, habitat for fauna, habitat fragmentation, edge effects, and reduced ecological connectivity. These impacts have been assessed in accordance with the Ecological Institute of Australia and New Zealand (EIANZ) guidelines (Roper-Lindsay et al., 2018) and cannot practicably be avoided, remedied or mitigated at the point of impact.

The tables from Section 5.4 have been replicated below for ease of reference. These detail the extent of the vegetation loss and impact. Section K.6 details the BCM inputs.

Table 9-17: Approximate in scope terrestrial habitat loss extents.

Vegetation type	Area of in scope vegetation not directly impacted by the indicative design (ha)	Approximate extent of in scope vegetation directly impacted by the indicative design (ha)	Total area of in scope vegetation in proposed designation (ha)
WF9 Taraire tawa podocarp forest	5.416	0.175	5.590
VS5 Broadleaved scrub	1.174	0.499	1.674
TL.2 Mixed native treeland	0.099	0.112	0.211
PL.2 Planted native >20 years	0.013	0.064	0.077
PL.3 Native or amenity plantings	0.008	0.001	0.010
EF.1 Exotic forest with native understorey	0.224	0.058	0.283
ES Exotic scrub	0.655	0.173	0.828
TL.3 Exotic treeland	0.262	0.094	0.356
EG Exotic grassland	0.018	0.000	0.018
WF9 Taraire tawa podocarp forest (134 Mill Road)	0.655	0.014	0.669
Totals	8.5	1.2	9.7

Table 9-18: Approximate extent of vegetation modified due to vegetation maintenance zone requirements associated with both bridges.

Vegetation type	Approximate area of in scope vegetation modified to construct and operate the bridges (including the vegetation maintenance zones) (ha)	Description of likely impact
WF9 Taraire tawa podocarp forest – Puhinui Gully	0.0138	Approaching total loss. For the purposes of this assessment assumed total loss.
VS5 Broadleaved scrub – Puhinui Gully	0.0161	Minor impacts of rain and light shadowing for the majority of the area. Small area at the southern end of the bridge where heights are lower more severely impacted. Canopy in the future expected to continue to increase in height but be maintained at a sub-canopy vegetation type.
WF9 Taraire tawa podocarp forest – Cheesman's bush	0.1107	Initial severe vegetation modification required, and total loss assumed for approximately a third of the vegetation where it occurs close to the bridge abutments. Within the centre of the gully post vegetation modification a sub-canopy vegetation type is expected to stabilise. Rain and light shadowing is also expected to influence vegetation composition to reflect a subcanopy composition.

K.5 Proposed Terrestrial Compensation

Section K.6 details the BCM inputs associated with the proposed compensation. As summarised below.

K.5.1 Compensation Action 1

Restoration planting of 10.36 ha to provide future WF9 forest habitat contiguous with existing mature forest, enabling natural colonisation by native lizards and birds.

K.5.2 Compensation Action 2

Restoration planting of 5.18 ha with specific lizard habitat supplementation to provide future WF9 forest habitat contiguous with existing mature forest, enabling natural colonisation by native lizards and birds.

K.5.3 Compensation Action 3

Restoration of 1.05 ha at 134 Mill Road, adjacent the remaining WF9 forest at Cheesman's Bush, including enhancement planting, pest control and weed control.

K.5.4 Compensation Action 4

Restoration and enhancement planting at Cheesman's bush (SEA_T_9102) to protect intact habitat from further degradation and support long-term forest regeneration.

K.5.5 Compensation Action 5

Restoration and enhancement planting at Puhinui Gully (SEA_T_4570) to protect intact habitat from further degradation and support long-term forest regeneration.

K.5.6 Method for Determining BCM Value Scores Before and After Compensation

The BCM assigns value scores to each habitat type to represent its ecological condition relative to the best possible example of that ecosystem (the benchmark). The scoring system reflects the extent to which the habitat expresses the structure, species composition, ecosystem function, and long-term resilience expected for mature, well-functioning WF9 forest in benchmark condition. These values are derived through assessment of the following attributes:

- Vegetation condition: canopy health, presence of exotic species, and degree of weed invasion.
- Vegetation structure: basal area, presence of canopy / subcanopy layers, and occurrence of old-growth trees.
- Species diversity: richness and density of native tree, sapling, shrub, and seedling species.
- Recruitment: presence and abundance of native seedlings and saplings indicating natural forest renewal.
- Management security: degree of pest pressure, extent of fencing, and presence/absence of active protection.

For all impacted areas I have provided conservative scoring (for example planted vegetation, native tree land, and exotic forest with native understory I have score 2/5 which is high compared the WF9 baseline.

For the post-compensation scores assigned to restoration planting, it is important to recognise that ecological recovery does not occur at a constant rate. Many ecosystem attributes establish relatively quickly following planting, including indigenous species richness, canopy development, vegetation cover, structural diversity, and habitat availability for common fauna. In contrast, the attributes that characterise mature WF9 forest, such as large canopy trees, complex vertical structure, extensive coarse woody debris, epiphyte communities, specialised microhabitats, and old-growth habitat features, take many decades or centuries to develop.

This pattern of rapid early gains followed by progressively slower rates of ecological improvement is consistent with the conceptual model of forest succession described by Acevedo-Charry and Aide (2019) (Figure 9-9). Although their model was developed to illustrate the recovery of vertebrate diversity during tropical forest succession, it also provides a useful conceptual representation of how ecological attributes,

functions and values accumulate through forest development. While restoration planting may accelerate the initial stages of recovery relative to natural regeneration through higher planting densities and greater species diversity, the later stages of ecosystem development remain constrained by time.

For this reason, the post-compensation value score assigned to restored WF9 habitat represents only a fraction of the value of a mature reference ecosystem. A score of one-fifth (1/5) of the benchmark of 5 which represents mature WF9 forest is considered appropriate because it recognises that many ecological functions and values will have been established within the assessment timeframe, while acknowledging that the defining characteristics of mature forest will remain largely absent. This approach avoids overstating the ecological gains achieved through restoration planting and provides a conservative estimate of compensation benefits.

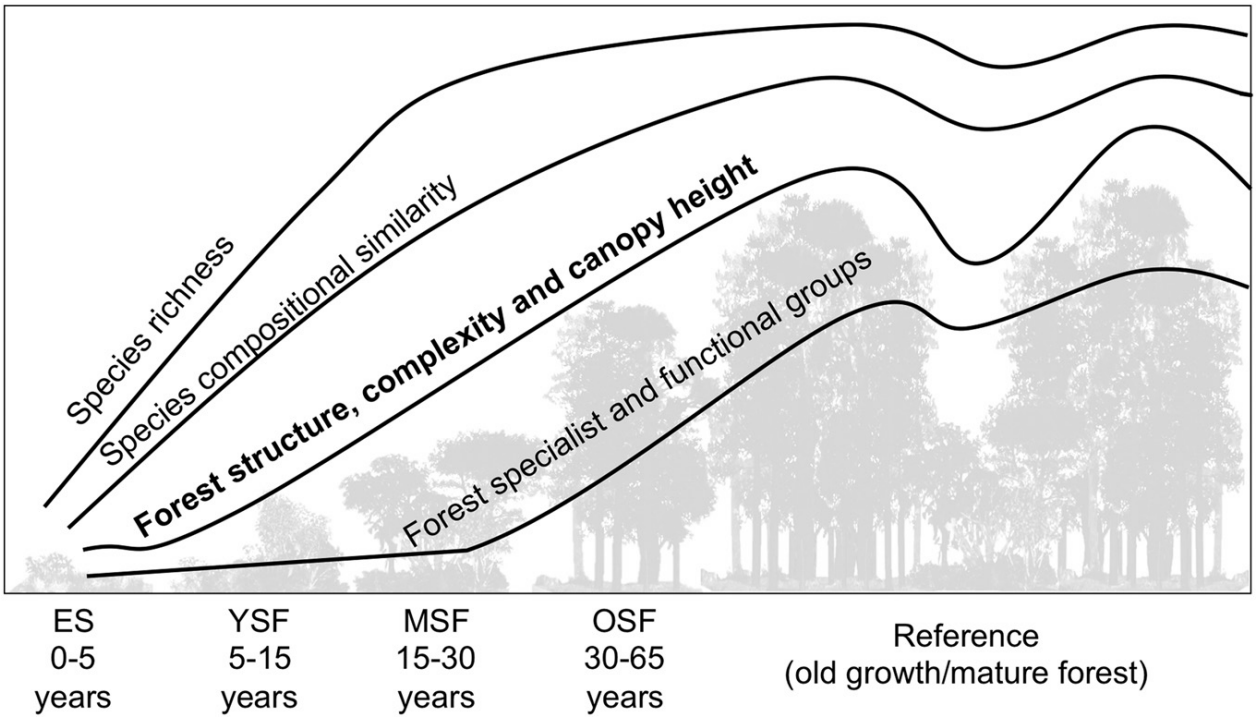


Figure 9-9: Conceptual trajectories of different measures of forest recovery during forest succession. Stages: ES, early succession; YSF, young secondary forest; MSF, mid-successional secondary forest; OSF, old secondary forest. Age (years below each category) reflects time since planting. Adapted from Acevedo-Charry and Aide (2019).

K.6 BCM model inputs

The BCM has been deliberately applied using conservative assumptions that are likely to overestimate residual effects and underestimate compensation gains. All vegetation directly affected by construction, including vegetation permanently modified beneath bridge structures, has been treated as a total loss despite these areas retaining some ecological function and habitat value following construction. For impact risk contingency, a very high risk multiplier has been applied to WF9 forest, increasing the quantified scale of effect by 20%, while a high-risk multiplier has been applied to all other vegetation and habitat types, increasing the quantified scale of effect by 10%. Similarly, a high uncertainty multiplier has been applied to WF9 and VS5 vegetation, increasing the quantified scale of effect by 20%, while a low uncertainty multiplier has been applied to all other habitats, increasing the quantified scale of effect by 10%. The uncertainty contingency is primarily relevant to WF9 and VS5 vegetation associated with bridge construction, where indirect effects may extend beyond the area assumed to be impacted. However, it is considered unlikely that actual effects would exceed the conservatively assumed total loss scenarios by the extent reflected in the uncertainty contingency.

Similarly, the compensation assessment adopts conservative assumptions regarding ecological gains. All compensation actions have been assigned a moderate confidence rating, reducing quantified compensation gains by 37.5%. The benefits of the proposed 10-year pest animal control programme have not been explicitly accounted for within the compensation calculations for the 134 Mill Road, Cheesman's Bush, or Puhinui Gully enhancement areas. Instead, only a minor increase in biodiversity value has been attributed to reflect reduced pest plant pressure and improved long-term regeneration outcomes. The assessment also assumes that restoration planting will achieve only one-fifth of the biodiversity value of a mature WF9 reference ecosystem after ten years. This is approximately half the value assigned elsewhere in the impact assessment to the most comparable young indigenous vegetation types and is considered a conservative representation of likely restoration outcomes.

The model also excludes several ecological benefits expected to arise from the wider restoration programme. Most notably, it does not include the proposed 4.15 ha of wetland and riparian restoration that will be established largely contiguous with the proposed WF9 restoration areas. These areas are expected to improve habitat connectivity, increase habitat heterogeneity, provide additional buffering of indigenous vegetation, and enhance riparian ecological functions. Consequently, the overall ecological gains achieved by the Project are likely to exceed those represented in the BCM outputs.

The BCM inputs are detailed and explained in Table 9-19, Table 9-20, and Table 9-21.

Table 9-19: Mill Road BCM inputs

Model inputs	Explanation
Biodiversity type	WF9 Biodiversity
Technical expert input(s)	Andrew Blayney
Benchmark	5. The benchmark represents an intact WF9 taraire, tawa, podocarp forest ecosystem. A healthy WF9 forest is characterised by a mature indigenous canopy, a diverse and regenerating understorey, low pest plant abundance, and ongoing recruitment of canopy species sufficient to maintain the forest over the long term. Under sustained pest animal and pest plant control, these forests typically exhibit improving condition, increasing structural complexity, abundant habitat resources, and support a diverse assemblage of indigenous flora and fauna associated with mature lowland forest ecosystems.
How many habitat types OR sites are impacted	Four habitat groups: WF9 forest; VS5 broadleaved scrub / forest; TL.2, PL.2, PL.3 and EF.1; and ES with TL.3.

Model inputs	Explanation
Number of proposed compensation measures	5
Net gain target	10%
Habitat/site impacted	WF9 forest (Cheesman's Bush, Puhinui Gully and 134 Mill Road); VS5 broadleaved scrub / forest; TL.2, PL.2, PL.3 and EF.1; ES and TL.3.
Impact contingency (value)	WF9 = 4 (very high); VS5 = 3 (high); TL.2/PL.2/PL.3/EF.1 = 3 (high); ES/TL.3 = 3 (high). Note these contingencies have been conservatively applied over and above actual ecological values. Scoring impacts: 3 = High risk/High value (calculated impact score is multiplied by 1.1 (+10%)) 4 = Very high risk/Very high value (calculated impact score is multiplied by 1.2 (+20%))
Impact contingency (uncertainty)	WF9 = 3; VS5 = 3; TL.2/PL.2/PL.3/EF.1 = 1; ES/TL.3 = 1. Scoring impacts: 1 = Low uncertainty (calculated impact score is multiplied by 1.05 (+5%)) 2 = Moderate uncertainty (calculated impact score is multiplied by 1.1 (+10%)) 3 = High uncertainty (calculated impact score is multiplied by 1.2 (+20%))
Areal extent of impact (ha) – Assumed total loss.	WF9 = 0.3135 ha; VS5 = 0.5151 ha; TL.2/PL.2/PL.3/EF.1 = 0.2360 ha; ES/TL.3 = 0.2670 ha.
Value score prior to impact	WF9 = 4.5. This reflects mature, regionally endangered forest with large native trees, threatened flora, potential bat roost features, bird habitat, lizard habitat and forest-floor invertebrate habitat. VS5 = 3.5. This reflects regenerating indigenous scrub / forest that is more modified than WF9 but retains native vegetation structure, buffering, bird habitat, lizard habitat and ecological connectivity. TL.2/PL.2/PL.3/EF.1 = 2.0. These habitats are modified but retain indigenous vegetation, buffering, local connectivity and fauna habitat functions. ES/TL.3 = 0.25. These habitats are predominantly exotic and have limited indigenous biodiversity value, although they can provide cover, bird and lizard habitat, and local landscape structure.
Value score after impact	0.001 for all habitat groups. Complete loss of the affected habitat has been assumed in the BCM.

Table 9-20: Mill Road BCM inputs for five compensation actions.

Compensation action	Area (ha)	Discount rate	Finite end point	Confidence contingency	Pre-compensation score	Post-compensation score
Revegetation of WF9	10.36	3%	10 years Confirmed period of effects management.	3 (50-75%) Calculated biodiversity gain is multiplied by 0.625. (quantified benefits reduced by 37.5%)	0.1	1.0
Revegetation of WF9 with lizard habitat supplementation	5.18				0.1	1.0
134 Mill Road restoration and planting	1.05				4.25	4.35
Restoration and enhancement planting at Cheesman's Bush (SEA_T_9102)	3.66				4.5	4.6
Restoration and enhancement planting at Puhinui Gully (SEA_T_4570)	3.26				4.0	4.1

Table 9-21: Mill road justification for BCM value scores before and after compensation

Compensation action	Support for pre-compensation score	Support for post-compensation score
Revegetation of WF9	The pre-compensation score of 0.1 reflects low-value starting habitat relative to the WF9 benchmark. I have used 0.1 as these areas may have partial cover of exotic vegetation which does provide some buffering and habitat value, but this will need to be controlled prior to planting.	The post-compensation score of 1.0 reflects establishment of native WF9 restoration planting using locally appropriate species. The score remains well below the benchmark because mature forest attributes such as large cavities, complex canopy structure, deep leaf litter, old-growth trees and long-established forest-floor habitat will take longer than the 10-year model period to develop.
Revegetation of WF9 with lizard habitat supplementation		The post-compensation score of 1.0 reflects native WF9 restoration planting with additional lizard habitat supplementation. The uplift recognises increased indigenous plant diversity, improved cover, habitat structure and connectivity. The score remains well below mature WF9 values because planted forest will not develop mature canopy, cavity, epiphyte and forest-floor functions within 10 years.
134 Mill Road restoration and planting	The pre-compensation score of 4.25 reflects an already high-value WF9 remnant or restoration setting close to the benchmark, but with some remaining edge effects, weed pressure or structural constraints.	The post-compensation score of 4.35 reflects a small but meaningful uplift from restoration planting, weed control and improved regeneration. The score is not higher because the site already has high baseline value and further maturity-related gains will continue beyond the 10-year model period.
Restoration and enhancement planting at	The pre-compensation score of 4.5 reflects high-value WF9 forest, including mature indigenous canopy, structural	The post-compensation score of 4.6 reflects a modest improvement from enrichment planting, weed suppression and improved regeneration processes within and adjacent to the

Cheesmans Bush (SEA_T_9102)	complexity and threatened flora habitat, but with remaining edge effects and management constraints.	SEA. The increase is deliberately small because the existing value is already high and some mature forest functions cannot be materially improved over only 10 years.
Restoration and enhancement planting at Puhinui Gully (SEA_T_4570)	The pre-compensation score of 4.0 reflects high-value forest and regenerating indigenous habitat (including a large proportion of VS5 vegetation), but with greater variability in canopy condition, weed pressure and edge exposure than the Cheesman's bush	The post-compensation score of 4.1 reflects targeted restoration and management that improve indigenous regeneration, suppress pest plants and strengthen forest resilience. The uplift is modest because the action enhances existing forest condition rather than creating a new mature forest ecosystem within the model period.

K.7 BCM model outputs.

The modelled outputs indicate a net gain outcome of 36.6% (Table 9-22), based on the total compensation score (1.375) exceeding the total impact score (−1.006) by 36.6%.

The result exceeds the BCM target of no net loss and a 10% net gain outcome, while applying conservative metrics, recognising the uncertainty associated with ecological restoration, time lags in forest development, and the inability of newly established habitats to fully replicate mature forest attributes within the assessment timeframe.

Table 9-22: Mill Road BCM model outputs

Model output	Model result
Total impact score	-1.0063571826
WF9 impact score	-0.406205712
VS5 impact score	-0.4758164136
TL.2/PL.2/PL.3/EF.1 impact score	-0.1089774840
ES/TL.3 impact score	-0.0153575730
Total compensation score	1.37499254299
Net gain outcome	36.6%

K.8 Conclusion

The BCM predicts a total impact score of -1.006 and a total compensation score of 1.375, resulting in a net gain outcome of 36.6%. The compensation package therefore exceeds the BCM target of 10% net gain and demonstrates that the proposed residual effects management package is sufficient to address the residual terrestrial biodiversity effects of the Project.

The positive outcome is driven primarily by the substantial area of indigenous restoration planting proposed adjacent to existing forest remnants, together with enhancement of existing indigenous habitat within Cheesman's Bush and Puhinui Gully. These actions will improve habitat extent, connectivity, ecological resilience, and long-term habitat availability for indigenous flora and fauna.

The modelled surplus should not be interpreted as indicating that mature indigenous forest features can be fully replaced within the 10-year assessment period. The Project will result in the loss and modification of mature and old-growth forest attributes that have developed over many decades or centuries and cannot be recreated within the timeframe of the assessment. The modelled surplus is therefore appropriate and necessary to account for temporal lags in ecological recovery, uncertainty associated with restoration outcomes, and the reduced ecological value of newly established habitats relative to mature forest ecosystems.

The assessment is also conservative because several ecological benefits are not fully captured within the model outputs. These include improvements in habitat condition arising from long-term pest plant and pest animal control, retention of habitat beneath bridge structures, retention of habitat features associated with modified trees, and the proposed 4.15 ha of wetland and riparian restoration that will be established contiguous with the proposed WF9 restoration areas. These additional measures will increase habitat heterogeneity, improve ecological connectivity, strengthen riparian ecological functions, provide additional buffering of remnant indigenous vegetation, and enhance the resilience of the wider ecological network.

Overall, the BCM demonstrates that the proposed compensation package is expected to more than compensate for the residual terrestrial biodiversity effects of the Project and will result in a positive long-term ecological outcome within the receiving environment. This means that I have a high level of confidence that if the effects management package is implemented as proposed in this assessment the project will result in a positive effect on terrestrial ecology.

APPENDIX L Assessment Against NPSIB Compensation Principles

I have assessed the proposed compensation package against the 13 principles for biodiversity compensation set out in Appendix 4 of the NPSIB. These principles are summarised in Table 9-23 below. In summary, the recommended residual effects management package is considered to align with compensation principles, with the possible exception of the loss of Significant Trees.

Table 9-23: Assessment against biodiversity offset and compensation principles set out in Appendix 4 of the NPSIB

Principle	NPSIB Explanation (adapted to combine principles for offsetting and compensation)	Compensation Package
Adherence to the effects management hierarchy	Biodiversity compensation is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, remedy, and offset adverse effects are demonstrated to have been sequentially exhausted.	**Principle met**: All practical steps to avoid, minimise, remedy, offset and compensate, for adverse effects on ecological values have been sequentially exhausted, before moving to the next step in the effects management hierarchy.
When biodiversity or compensation is not appropriate	Biodiversity compensation is not appropriate where indigenous biodiversity values are not able to be offset or compensated for. Examples of biodiversity compensation not being appropriate include where: (a) the indigenous biodiversity affected is irreplaceable or vulnerable; (b) effects on indigenous biodiversity are uncertain, unknown, or little understood, but potential effects are significantly adverse or irreversible; and (c) there are no technically feasible options by which to secure a proposed net gain within acceptable timeframes.	**Principle partially met**: The loss of Significant Trees is not irreplaceable however there are significant time lags (in conflict with (c) of this principle).
Scale of biodiversity compensation	The indigenous biodiversity values lost through the activity to which the biodiversity compensation applies are addressed by positive effects to indigenous biodiversity (including when indigenous species depend on introduced	**Principle met.** Principle met for those values that can feasibly be compensated within the surrounding landscape and for which the benefits of the proposed compensation measures are expected to outweigh impacts associated with the Project impacts.

Principle	NPSIB Explanation (adapted to combine principles for offsetting and compensation)	Compensation Package
	species for their persistence), that outweigh the adverse effects.	
Additionality	Biodiversity compensation achieves gains in indigenous biodiversity above and beyond gains that would have occurred in the absence of the compensation, such as gains that are additional to any minimisation and remediation or offsetting undertaken in relation to the adverse effects of the activity.	**Principle met**: Proposed enhancement measures will all be additional (over and above what would have happened in the absence of the Project).
Leakage	Biodiversity compensation design and implementation avoids displacing harm to other indigenous biodiversity in the same or any other location.	• **Principle predominately met:** Proposed habitat restoration will occur in land currently covered with exotic grass that may currently support copper skink or pipit. • The required control of the vegetation my impact these habitats to a relatively small degree, however its medium-term benefits outweigh the immediate impacts.
Long-term outcomes	Biodiversity compensation is managed to secure outcomes of the activity that last as least as long as the impacts, and preferably in perpetuity. Consideration must be given to long-term issues around funding, location, management, and monitoring.	**Principle met**: Benefits of planting established during a 10 year establishment period. Continued forest regeneration and maturation expected to continue into the future.
Landscape context	Biodiversity offset or compensation is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the offset/compensation site, taking into account interactions between species, habitats and ecosystems, spatial connections, and ecosystem function.	**Principle met:** The proposed recommended habitat restoration and enhancement is undertaken at locations adjacent to and near the impact sites. The recommended enhancement sites have been selected to provide habitat connectivity in the landscape.

Principle	NPSIB Explanation (adapted to combine principles for offsetting and compensation)	Compensation Package
Time lags (compensation only)	The delay between loss of, or effects on, indigenous biodiversity values at the impact site and the gain or maturity of indigenous biodiversity at the offset or compensation sites are minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).	**Principle met:** For those biodiversity values for which compensation is proposed time lag is factored into models. Conservative model inputs and overshoot of required positive benefit also mitigate any time lag.
Trading up (compensation only)	When trading up forms part of biodiversity compensation, the proposal demonstrates that the indigenous biodiversity gains are demonstrably greater or higher than those lost.	**Principle met:** The majority of the proposal is like for like. However WF9 forest is the end goal for all planting and this is proposed to replace VS5, planted native vegetation types, and exotic vegetation types which is a trade up of the ecological values from that lost.
Financial contributions (compensation only)	A financial contribution is only considered if: (a) there is no effective option available for delivering biodiversity gains on the ground; and (b) it directly funds an intended biodiversity gain or benefit that complies with the rest of these principles.	Not applicable
Science and mātauranga Māori	The design and implementation of biodiversity offsets and compensation is a documented process informed by science, and mātauranga Māori.	**Principle met**: Extensive engagement undertaken with mana whenua.
Tangata whenua and stakeholder participation	Opportunity for the effective and early participation of tangata whenua and stakeholders is demonstrated when planning for biodiversity offsets and compensation, including its evaluation, selection, design, implementation, and monitoring.	**Principle met**: Extensive engagement undertaken with mana whenua.
Transparency	The design and implementation of biodiversity offsets and compensation, and communication of its results to the	**Principle met**: Due to time restrictions, engagement with the community/public has been minimal within this phase however previous Auckland Transport

Principle	NPSIB Explanation (adapted to combine principles for offsetting and compensation)	Compensation Package
	public, is undertaken in a transparent and timely manner.	designation involved considerable input from the public. The design proposed now has less environmental effects and the effects management package is greater than that previously required in the past designation conditions..