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Golding Road Private Plan Change Ecological Assessment



By JS ECOLOGY LTD

**For: Golding Meadows Ltd and
Auckland Trotting Club Inc**

Contents

EXECUTIVE SUMMARY	4
1 INTRODUCTION.....	6
1.1 Background.....	6
1.2 Purpose and scope	7
2 SITE DESCRIPTION	9
3 LANDSCAPE AND ECOLOGICAL CONTEXT	9
4 PUKEKOHE-PAERATA STRUCTURE PLAN.....	12
5 METHODS.....	12
5.1 Desktop assessment.....	12
5.2 Field assessment	13
5.2.1 Assessment of watercourses	13
5.2.2 Natural wetlands.....	14
5.2 Aquatic Fauna.....	17
5.3 Botanical survey	17
5.4 Terrestrial Fauna	18
6 RESULTS.....	18
6.1 Watercourses and aquatic values	18
6.1.1 Stream classification	18
6.1.2 Stream aquatic values.....	23
6.1.3 Wetlands	24
6.1.4 Ponds.....	30
6.1.5 Aquatic fauna	31
6.1.6 Fish passage	32
6.2 Summary of Freshwater values.....	32
6.3 Botanical Values	37



6.3.1	Native vegetation.....	37
6.3.2	Exotic vegetation	41
6.4	Terrestrial fauna values.....	43
6.4.1	Birds	43
6.4.2	Lizards	43
6.4.3	Bats.....	43
6.5	Summary of terrestrial ecological values.....	45
7	ASSESSMENT OF EFFECTS OF POTENTIAL CHANGES IN LAND USE ON ECOLOGICAL VALUES.....	46
7.1	Assessment of the overall scale of ecological effects	46
7.1.1	Key ecological values	46
7.1.2	Assessment of the magnitude of effects	47
7.1.3	Assessment of level of effects	49
7.2	Potential ecological effects of changes to land use	50
7.2.1	Potential adverse impacts.....	50
7.2.2	Potential biodiversity benefits of development.	51
7.2.3	Relevant policy documents.....	52
8	RECOMMENDATIONS	53
8.1	Impact management	53
8.2	Freshwater ecology impact management	54
8.2.1	Recommendations of the ecology report for the Pukekohe-Paerata Structure Plan	54
8.2.2	Specific recommendations for the Golding Meadows PPPC.....	57
8.3	Terrestrial Ecology.....	59
8.3.1	Recommendations of the ecology report for the Pukekohe-Paerata Structure Plan	59



8.3.2 Specific recommendations for the Golding Meadows PPPC.....60

9 CONCLUSIONS.....61

10 REFERENCES.....63

APPENDIX 1 Schedule 3 Significant Ecological Areas – Terrestrial Schedule65



EXECUTIVE SUMMARY

A Private Plan Change is proposed for an area within the Pukekohe–Paerata Structure Plan area on land owned by the Auckland Trotting Club Inc. and Golding Meadows Ltd. The Proposed Plan Change ('PPC') applicants intend to rezone the 82.66 hectare site for housing and light industrial activities.

JS Ecology was engaged by the applicants to undertake an assessment of the existing ecological values of the site in terms of terrestrial and freshwater ecology. This assessment is to support the PPC.

The approach taken was a desktop survey and a field survey of the terrestrial and freshwater ecological values of the site. Site visits were undertaken on 12th and 24th of August 2020. Further fieldwork was undertaken to delineate potential wetland areas on 13th November 2020 in response to the enactment of the National Environmental Standards for Freshwater Regulations in September 2020.

The terrestrial and freshwater ecological values of the site were found to be low overall. The area has been extensively modified with numerous drainage ditches and straightening of watercourses. Aquatic habitat values were found to be generally low across the site with only the lower part of the Tutaenui Stream retaining a natural channel configuration.

Intensive grazing and stock access to some of the waterways continue to degrade freshwater habitats. Lack of riparian shading, channelization of streams and overgrowth of aquatic macrophytes are all contributing to poor aquatic habitat values. An estimated 1632m of permanent streams and 1148m of intermittent streams occur at the site.

Potential wetland habitat was found to be mainly damp pasture dominated by exotic pasture species. A raised artificial pond may be contributing to several small wet areas that are dominated by water celery, an exotic wetland species. Saturated soils in these areas are silty alluvium. These potential areas of wetland were not considered to be "natural" due to the modified hydrology and predominance of exotic pasture species.

Indigenous terrestrial habitats were largely restricted to a small fragment of kahikatea-pukatea forest (0.33 hectares), some small areas of native tree land and scattered mature native trees. The kahikatea-pukatea forest fragment meets the criteria for being classified as a Significant Ecological Area due to its critically endangered status in the Auckland Region.

Only common native birds and one common species of freshwater fish (shortfin eel) were observed at the site. Lizards were not observed and little habitat exists for them at the site other than for copper skinks which are a relatively common species.

No threatened flora or fauna species were recorded for the site. There is some potential for long-tailed bats to seasonally use large native trees as roosts, however no bat surveys have been undertaken as yet.

Generally, potential adverse effects can be managed through the existing provisions and rules contained in the AUP. The implementation of the recommendations of the Ecology Report for the site would see important improvements in terrestrial and aquatic habitat values if fully implemented which are not already addressed by AUP methods.

Key Recommendations:

1. Creation of ecological corridors across the site through:
 - (a) Riparian restoration and protection of permanent and intermittent streams
 - (b) Repatriation of highly modified and straightened streams to improve aquatic habitat values
 - (c) Protection and enhancement of native forest.
 - (d) Recreation of native wetlands along the lower Tutaenui Stream
2. Inclusion of threatened plant species within restoration areas.

The PPC supports the relevant objectives and policies of the National Policy Statement for Freshwater Management 2020 and Draft National Policy Statement on Indigenous Biodiversity.



1 INTRODUCTION

1.1 Background

A PPC is proposed for land within the Pukekohe–Paerata Structure Plan Areas F & H and adjacent land owned by the Auckland Trotting Club Inc. and Golding Meadows Ltd (Figure 1).

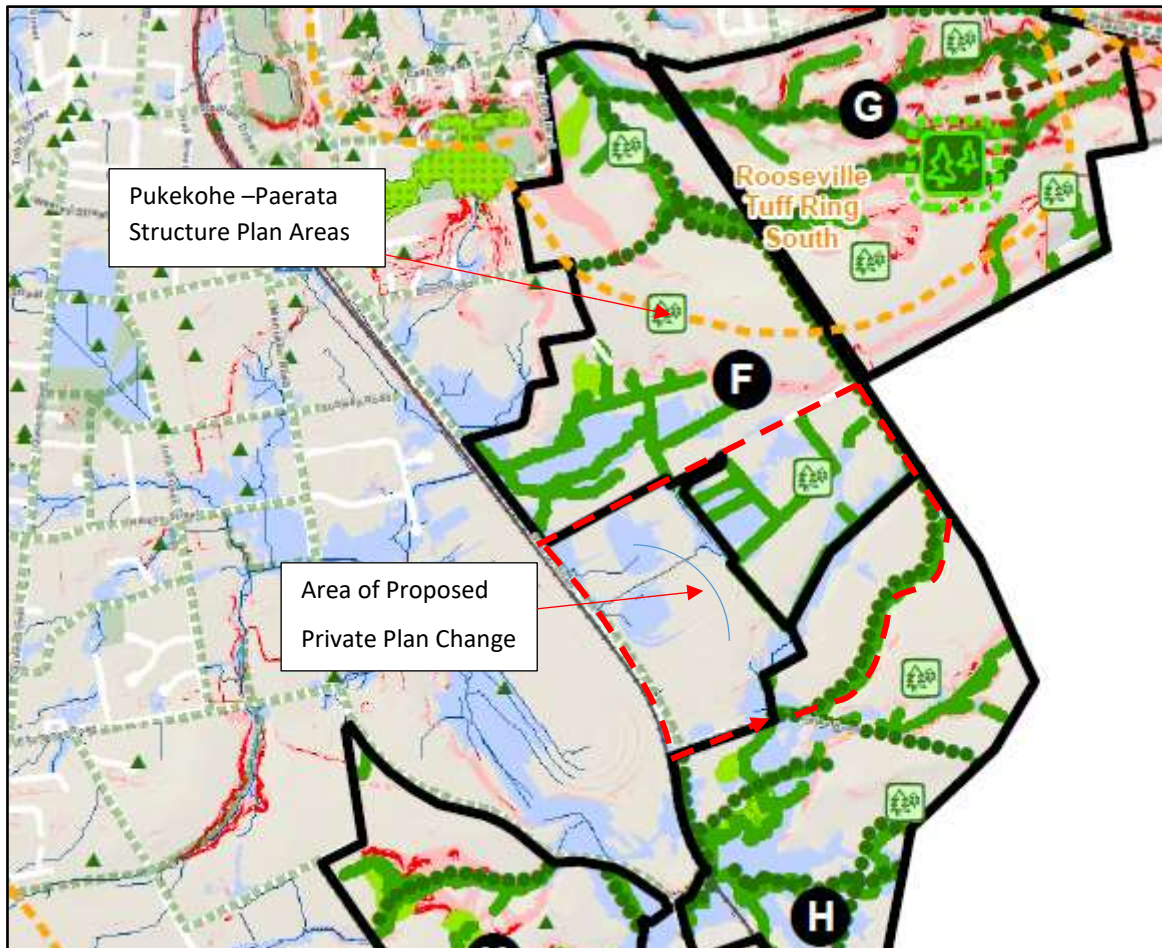


Figure 1 Area of Proposed Private Plan Change (excerpt from the Pukekohe –Paerata Structure Plan 2019 Environmental Map by Auckland Council)

This report provides information on the ecological features of the PPC area shown in Figure 1 including terrestrial and freshwater ecological values. Properties assessed include: 240 & 242 Station Road, 27 & 49 Yates Road, 152 – 162 Golding Road and 17, 25, 27 & 27A Royal Doulton Drive.

1.2 Purpose and scope

JS Ecology has been engaged by Golding Meadows Ltd and the Auckland Trotting Club to undertake an ecological assessment of the proposed development site in terms of aquatic and terrestrial ecology. The approach taken included desktop assessments of existing information to identify:

- Areas of native vegetation and particularly any meeting the criteria for Significant Ecological Areas (SEA);
- Review of databases to assess the likelihood of species of conservation significance being present including nationally and regionally threatened or at risk species, in particular freshwater fish, native lizards, plants, bats and birds;
- Areas that would qualify as wetlands under the National Environmental Standards for Freshwater (2020) and the National Policy Statement for Freshwater Management (2020).

Field work included a full site walkover to:

- Identify areas of native and exotic vegetation and significant individual native trees;
- Identify any areas meeting criteria for Significant Ecological Areas (SEA) under the Auckland Unitary Plan (AUP);
- Map the boundaries of and classify stream types (permanent, intermittent and ephemeral based on the AUP definitions);
- Qualitatively assess aquatic habitat values;
- Map wetlands, ponds and any constraints to natural stream function e.g. culverts, channelization;
- Identify habitats for, or presence of nationally or regionally threatened or at risk species.

The Auckland Council report: “Ecology Assessment: constraints and opportunities report: Pukekohe-Paerata Structure Plan” (Sinclair 2019) provided an outline of the ecological information required to inform the PPC.



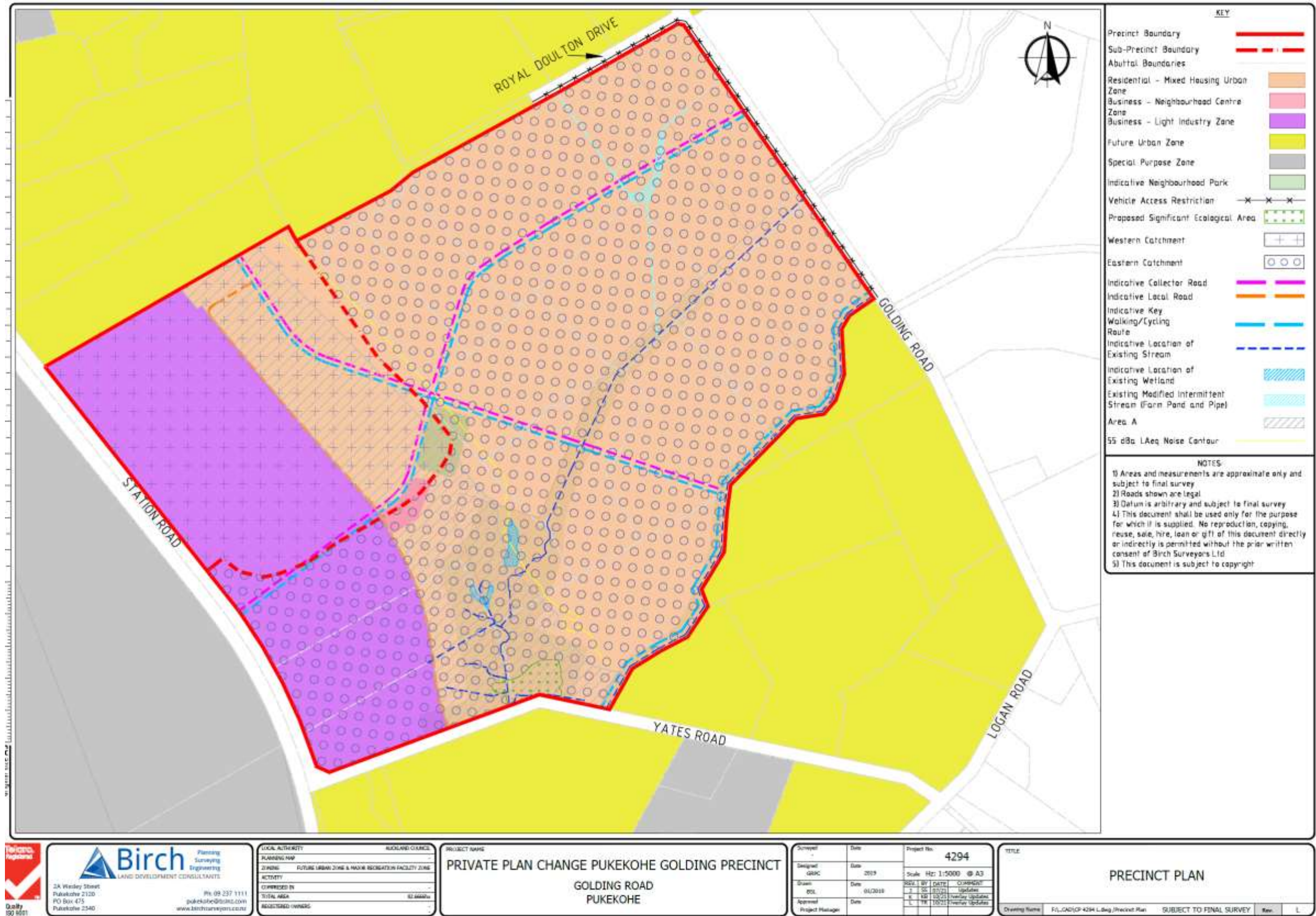


Figure 2 Precinct plan and zoning plan for the Private Plan Change

2 SITE DESCRIPTION

The total area of the site is 82.66ha with the majority of the land utilised for the keeping and training of horses for the horse racing industry. There are two trotting tracks, stables and other utility buildings associated with the industry. Other land uses include an olive orchard and lifestyle blocks.

The land is generally flat to very gently contoured at c. 60m a.s.l.¹ It is drained by tributaries of the Tutaenui Stream which flows to the Waikato River near Tuakau. Soils are clays derived from tephra and described as Typic Orthic Granular Soils (Morrinsville_8a.1) and Typic Orthic Gley Soils (Temuka_76.2) as mapped by Landcare Research (Smap-online). Well drained soils are likely present on the more elevated eastern side of the site as described in the geotechnical report (Ground Consulting November 2020) with poorly drained, gleyed alluvial soils consisting of silt, clay and layers of peat on the low lying western side.

The land is highly modified with little natural vegetation remaining. Significant reaches of the Tutaenui Stream and its upper tributaries are channelized with little or no riparian vegetation and there are two artificial ponds. The soft-bottomed streams have significant reaches where bank erosion is evident and overgrowth of emergent macrophytes is common. The land area is generally divided up into numerous small paddocks which are intensively grazed. Large exotic trees such as poplars (*Populus deltoides*) and Monterey pine (*Pinus radiata*) form shelterbelts in some parts of the site while individual relict native kahikatea (*Dacrycarpus dacrydioides*) and totara (*Podocarpus totara*) trees are found in various locations. Only one small forest remnant (0.33ha) is found adjacent to Yates Road and the Tutaenui Stream.

3 LANDSCAPE AND ECOLOGICAL CONTEXT

The site lies within the Manukau Ecological District (ED) in the Auckland Ecological Region (Mc Ewen 1987). All native ecosystems in this ED are severely depleted and many remaining ecosystems are dominated by exotic species (Lindsay et al 2009). The original forests of the Manukau ED included characteristic northern North Island lowland forest types containing

¹ Above sea level

abundant taraire and puriri. Alluvial flats and terraces throughout the ED once supported extensive stands of kahikatea swamp forest, but these have largely been drained and converted to farmland. Only 3% of the original area of native vegetation within the Manukau ED remains and only 0.4% of native freshwater wetlands remain of which very little is formally protected.

The original vegetation cover of the site would have been bog or fen in the northern and western parts of the site with kahikatea and pukatea forest (Singers et al WF8) along the main Tutaenui stream and puriri forest (WF7) over most of the rest (Auckland Council Geomaps biodiversity layer) (Figure 3). A broad range of native birds including kiwi and a range of native reptiles such as forest geckos, elegant gecko, Pacific gecko and ground dwelling skinks would have inhabited the forests. Within swamps native wetland birds including now threatened species such as banded rail, spotless crane, pateke, and bittern would have been found.

Freshwater systems were originally dominated by the large area of wetlands that also covered the present day Pukekohe race track and lower end of Manukau Road. Lowland watercourses associated with the wetlands would have been slow-flowing with high water quality and high aquatic habitat values. A range of native freshwater fish species including galaxiids, eels, koura, bullies and black mudfish would have been found within the swamps and watercourses where a high diversity of aquatic macroinvertebrates would also have been found.



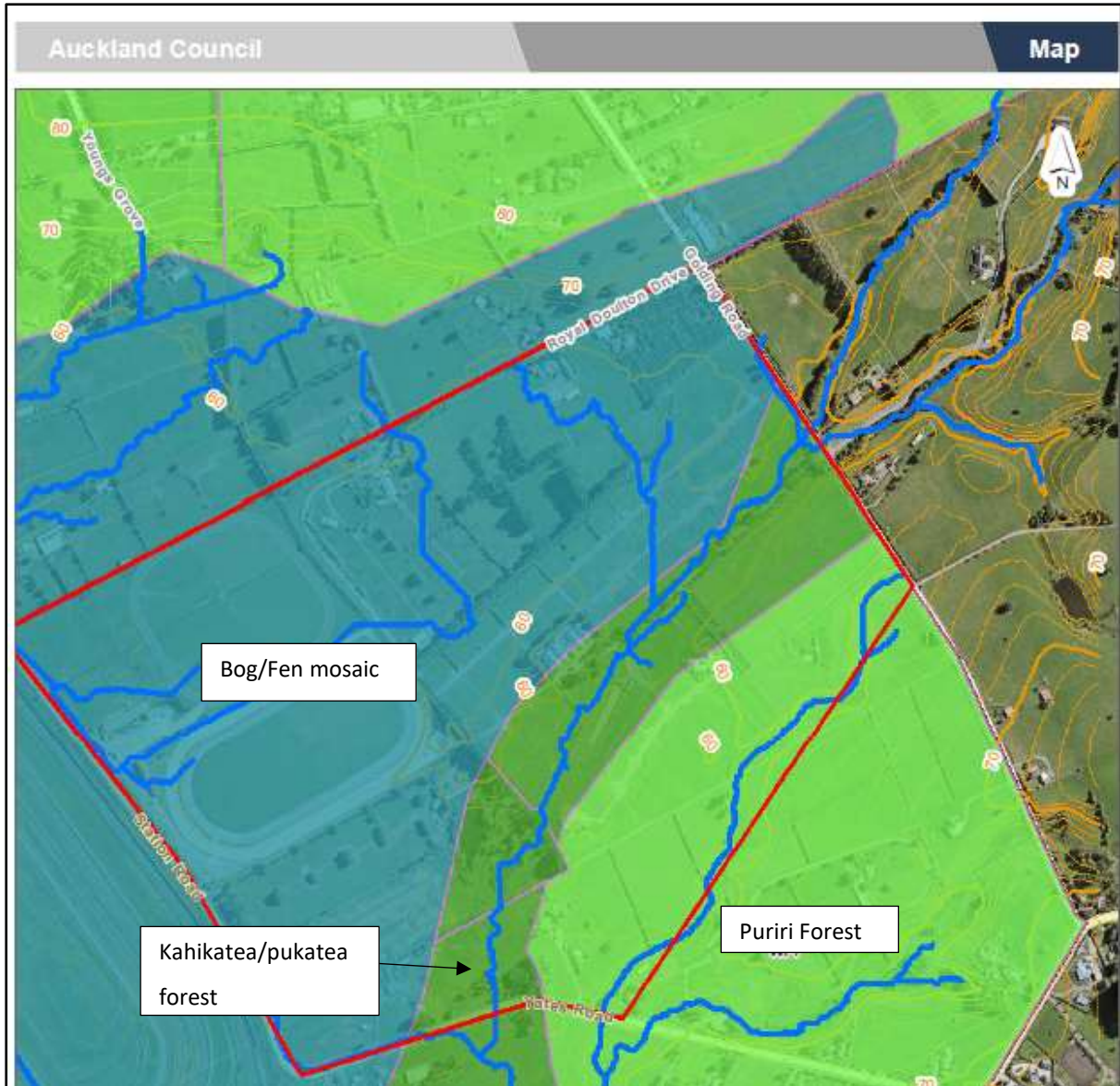


Figure 3 Original vegetation types of the PPC area (Auckland Council Geomaps biodiversity layer)



4 PUKEKOHE-PAERATA STRUCTURE PLAN

Auckland Council has prepared an ecology report (S. Sinclair 2019) setting out the ecological constraints and opportunities for the Pukekohe-Paerata Structure Plan area.

The report highlights the constraints to development as:

1. Proximity of developable area to watercourses
2. Avoidance of watercourse loss i.e. no permanent loss with culverting
3. Avoidance of vegetation loss, especially Significant Ecological Areas

Opportunities identified for improvement of ecological values include:

1. Retaining and enhancing remaining native vegetation to improve wildlife habitat
2. Retaining and buffering natural watercourses to improve water quality and increase numbers and diversity of instream biota
3. Retaining natural topography to ensure watercourses can maintain natural form and function
4. Aligning reserves and recreational connections with existing natural watercourse corridors to provide user integration with nature and wider buffering for wildlife movement
5. Reintroducing riverine wetlands to natural floodplains to provide recharge of water tables
6. Repatriation of modified watercourses to reinstate sinuosity and habitat heterogeneity

This ecological report documents the ecological features of the PPC site and considers how the constraints and opportunities set out in the Auckland Council report can be incorporated into the design of the PPC.

5 METHODS

5.1 Desktop assessment

Aerial photographs of the site from Google Earth and Auckland Council Geomaps (“Geomaps”) were viewed and various features were identified for investigation including watercourses, potential wetland areas and areas of vegetation. The hydrology layer of



Geomaps and historic aerial photography dating back to 1942 (Retrolens: <http://retrolens.nz/map>) were viewed to identify watercourses and any modifications. An existing Auckland Council Technical Report entitled “Pukekohe Tutaenui Stream Catchment Watercourse Assessment” (4Sight Consulting and Urban Solutions 2018) was reviewed and various other databases and publications were consulted to identify the potential for threatened or at risk species or ecosystems to be present including:

- Auckland Regional Threatened and Uncommon Plants List. (Stanley et al 2005)
- Indigenous Terrestrial and Freshwater Ecosystems of Auckland.(Singers et al 2017)
- National Freshwater Fish Database: National Institute of Water & Atmospheric Research Ltd
- Atlas of the amphibians and reptiles of New Zealand database

5.2 Field assessment

5.2.1 Assessment of watercourses

The site is part of the Tutaenui Stream catchment which is a sub catchment of the Waikato River. The main Tutaenui Stream was walked from the Yates Road Bridge upstream to the northern boundary of 162 Golding Road. Tributaries of the Tutaenui were investigated including a large tributary that forms the south eastern edge of the proposed private plan change area. Two ponds were investigated, one at 240 Station Road (Auckland Trotting Club) and a smaller pond at 152 Golding Road (YLH Holdings Ltd). No quantitative data was collected at this stage however. Features noted visually were relative water clarity/silt loading, instream macrophytes, bank profiles and stability, aquatic habitat, riparian vegetation and shading. Streams were classified according to definitions given in Chapter J1 of the AUP-OP.

Stream definitions

River or stream A continually or intermittently flowing body of fresh water, excluding ephemeral streams, and includes a stream or modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the



supply of water for electricity power generation, and farm drainage canal except where it is a modified element of a natural drainage system).

Permanent river or stream: The continually flowing reaches of any river or stream.

Intermittent stream: reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

1. It has natural pools;
2. It has a well-defined channel, such that the bed and banks can be distinguished;
3. It contains surface water more than 48 hours after a rain event which results in stream flow;
4. Rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;
5. Organic debris resulting from flood can be seen on the floodplain; or
6. There is evidence of substrate sorting process, including scour and deposition

Ephemeral stream: reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.

5.2.2 *Natural wetlands*

Natural wetlands are protected under the National Environmental Standards for Freshwater 2020 (NES-FW).



Areas identified in the Geotechnical report for the site (Ground Consulting Ltd, September 2020) as being “wet land” and any other areas identified during the field surveys were assessed using published wetland delineation protocols (MfE 2020, Clarkson, 2013).

Wetland definitions: Wetlands are defined in the Resource Management Act (1991) as “permanently or intermittently wet areas, shallow water, and land-water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions”.

The National Policy Statement for Freshwater Management (NPS_FW) further defines a natural wetland as a wetland that is not:

- A wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or
- A geothermal wetland; or
- Any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rainwater-derived pooling.

Wetland delineation protocols (MfE 2020)

The area is <2ha and therefore representative plots were established in each major vegetation type: trees, sapling/shrub, herb as described in Clarkson 2013 and set out in Table 1.



Table 1 Summary of plot strata.

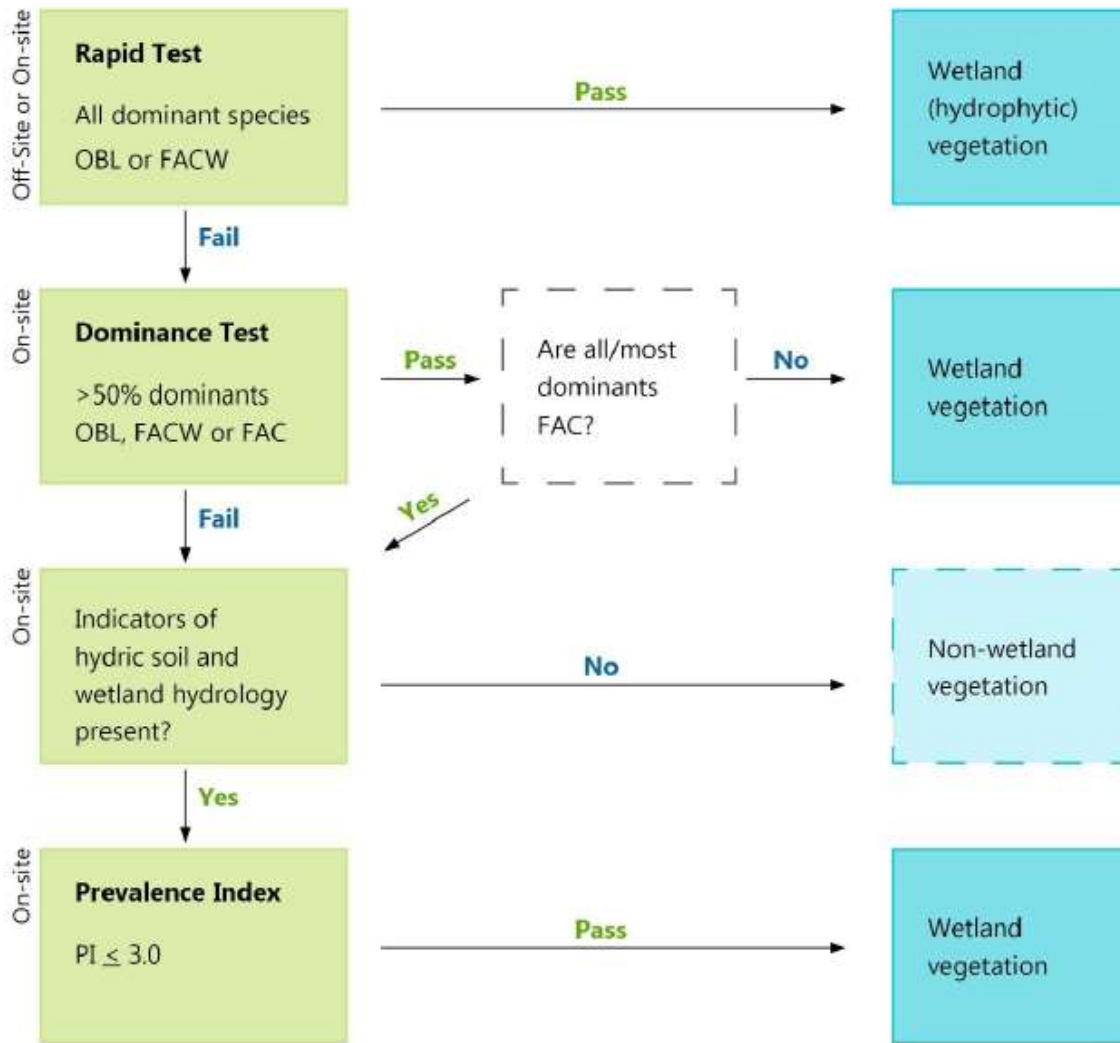
Stratum	Description	Plot size	Notes
Tree	Woody plant >10cm dbh ²	Circular 10m plot radius	All woody plants regardless of height, includes woody climbers, blackberry All herbaceous plants regardless of height. Includes herbaceous climbers
Sapling/shrub	Woody plant <10cm dbh	Circular plot 5m radius	
Herb	All non-woody plants	2m x 2m quadrat	

Hydrophytic vegetation determination based on the collected data was conducted using the following flow chart (Figure 4) and the wetland indicator status ratings for species found in Clarkson et al. 2013.

Figure 4: Flow chart of steps for hydrophytic (wetland) vegetation determination. \Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland.

² Diameter at breast height





5.2 Aquatic Fauna

The positions of culverts and crossings were noted and main crossings investigated to determine whether fish passage was maintained. Local records for instream fauna include low numbers of shortfin eel (*Anguilla australis*) and koura (*Paranephrops planifrons*).

Incidental observations of aquatic fauna were recorded.

5.3 Botanical survey

Areas of native vegetation were identified both from aerial photographs and visual assessment. Individual large trees and areas of vegetation were investigated and the species present and community composition was recorded. Areas of native vegetation were



assessed against the indigenous terrestrial and wetland ecosystems of Auckland guide (Singers et al., 2017) and the factors contained within Schedule 3 - Significant Ecological Areas (Terrestrial Schedule) of the AUP-OP.

5.4 Terrestrial Fauna

Incidental observations of birds and mammals were made in the course of the site survey. No targeted searches for lizards were undertaken although their likely presence can be inferred from the habitat that occurs at the site. Bat surveys were not undertaken at this stage.

6 RESULTS

An assessment of the site was carried out on 12th and 24th of August 2020. Further fieldwork was undertaken to delineate wetland areas on 13th November 2020 in response to the enactment of the NES-FW.

6.1 Watercourses and aquatic values

6.1.1 Stream classification

Permanent and intermittent streams flowing across the site are shown in Figure 16. When compared to the Geomaps hydrology layer for overland flow paths the actual location and configuration of flow paths for the western half of the site differs significantly from that shown in Geomaps. Geomaps hydrology layer was created by the Auckland Council Stormwater Hydraulic Modelling Team and was last updated in June 2013. It gives the predicted path stormwater takes, in a rain event, as it flows downhill over the land.

The land is flat in the western part of the site and as it was originally a swamp, any original water courses would not necessarily have followed the paths modelled in the hydrology layer of Geomaps.

The land has been significantly modified (drained) and historic aerial photographs from 1941 (Figure 5) onwards do not show any natural water courses on the lower western side of the Tutaenui Stream. Rather a network of ditch drains feed into the lower Tutaenui Stream. Two large trotting tracks occupy most of the Auckland Trotting Club site in the western corner of the site.



The Tutaenui Stream and a minor upper tributary have been straightened and channelized since at least 1961 according to historic aerial photographs, such that the Tutaenui is channelized for over two thirds of its length at the PPC site (Figure 6). Only the lower third of the Tutaenui Stream has a natural, channel configuration (Figure 7). The minor tributary has been largely culverted since at least 1981. A major tributary of the Tutaenui Stream that runs along the eastern boundary of the site has a largely natural configuration although a section of it had recently been cleared with a digger at the time of the ecological assessment (Figure 8). The main western drain runs between steep banks and joins the Tutaenui stream (Figures 9 & 10).

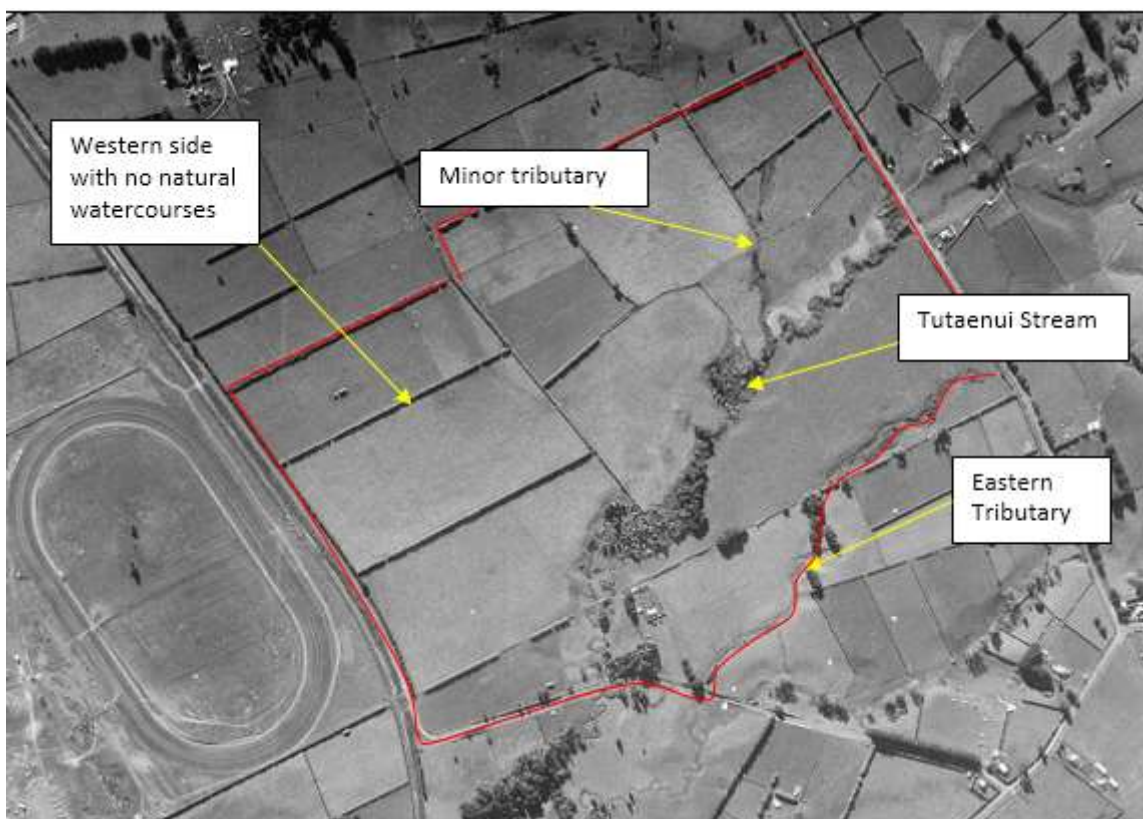


Figure 5 1942 aerial photo of the project area showing the largely unmodified Tutaenui Stream and lack of natural watercourses on the western side where two trotting tracks are now located





Figure 6 Upper Tutaenui Stream showing channelization and straightening.

The Tutaenui Stream was assessed as being permanent as was the lower part of the main eastern tributary. All other water courses mapped in Figure 16 were deemed to be intermittent. Numerous ephemeral overland flow paths exist, however these were extremely difficult to map due to pugging of the ground by horses and cattle. They have not been included in Figure 4. The western drainage channels are artificial as evidenced by historic aerial photographs and are excluded from the definition of a natural stream.





Figure 7 Lower Tutaenui Stream showing a natural channel configuration and riparian vegetation of pest plants



Figure 8 Main eastern tributary along the fenced section at 158 Golding Rd





Figure 9 Lower main western drain just above its confluence with the Tutaenui Stream with abundant emergent and submerged macrophytes.



Figure 10 Main western drain as it runs in a straight channel beside the central driveway. Note the steep banks and discolouration of the water.



6.1.2 Stream aquatic values

Riparian shading

Riparian shading is poor in general. Parts of the Tutaenui Stream have some shading with exotic trees such as pine trees or amenity vegetation along some sections. The lower parts of the stream have generally better shading and close to Yates Road the native forest remnant there provides excellent shading. The main tributary to the east has virtually no riparian vegetation and the highly modified drainage channels on the western side are generally open with little shading except where they run next to shelterbelts. Riparian vegetation is sparse across the site.

Water quality

Water clarity was moderate to low. The upper reaches of the Tutaenui Stream and its main tributaries was moderate, however the lower Tutaenui Stream had low water clarity. During heavy rain water clarity would significantly degrade as sediments from the soft-bottomed streams became mobilised. The channelized western drain running beside the central driveway had low water clarity as did the feeder drains draining into it. This was attributed to livestock pugging feeder drains and runoff from the southern training track.

Bank stability

Streams are moderately incised in silty banks, however they mostly carry low vegetation of exotic weeds and pasture plants. The banks of the lower Tutaenui are impacted by cattle. Bank stability was assessed as moderate to low.

Instream macrophytes

Emergent and submerged macrophytes were present in Tutaenui Stream. Oxygen weed (*Lagarosiphon major*) grows throughout the stream and water pepper (*Persicaria hydropiper*) is plentiful as an emergent, although during winter it dies back. Other common macrophytes were water cress (*Nasturtium officinale*), water celery (*Apium nodiflorum*), Mercer grass (*Paspalum distichum*) and starwort (*Callitriche stagnalis*).



Aquatic habitat

Aquatic habitat quality is generally low. Most streams have little riparian shading and low – moderate water clarity. The surrounding landuse and presence of significant cover of aquatic macrophytes indicates that nutrient loadings are high. During summer many of the stream reaches would become choked with water pepper and other emergent aquatic macrophytes. The extensive channelization of the water courses means there is little natural habitat variability with few pools or riffles and little instream woody debris except in the lower third of the main Tutaenui Stream.

6.1.3 Wetlands

Although the north western side of the site would have originally been a wetland type (bog/fen), the hydrology has been extensively altered. An area of “wet land” adjacent to the lower Tutaenui Stream was identified by the geotechnical report and this area may still retain wetland hydrology although it now supports only relict kahikatea trees standing in wet pasture. The area, (< 1ha) is badly pugged by livestock. Figure 11 shows an aerial photograph of the area taken in 1961 prior to construction of the large pond to the west of the area in which it appears to be open pasture with scattered trees.





Figure 11 1961 aerial photo showing the area west of the Tutaenui Stream prior to the construction of the water supply pond (orange bounded area).

Wetland delineation was undertaken in accordance with the Ministry for the Environment Wetland Delineation Protocols (MfE 2020 and Clarkson 2013). Three plots located to the east of the large pond were assessed. The area is normally grazed, however there were no livestock present at the time of the assessment and there was enough spring growth for plant species were able to be reliably identified at these locations. To the west and south of the pond intensive grazing by horses did not allow reliable identification of all species present.

Results and discussion: Mapping of areas of wet pasture and locations of plots are shown in Figure 13. Plot data sheets are found in Appendix 2 and the results of the assessment are summarized in Table 2.



Table 2 Summary of plant indicator species scores for Plots 1 - 3

Plot number	NZTMS co-ordinates	Dominance test % OBL, FACW & FAC species	% of dominant species that are FAC	Prevalence index
1	E 1770985 N5879724	100%	100	2.96
2	E 1770970 N 5879678	100%	50	1.73
3	E 1771035 N 5879644	100%	100	3.00

Based on the plant species present and their wetland indicator status (Clarkson 2013) all three plots passed the dominance test and the prevalence test. Plot 2 was dominated by water celery which is an obligate wetland species (OBL) and wetland conditions clearly existed here at the time of the assessment. Plots 1 and 3 however, had 100% of dominant species that were facultative species (FAC). These species commonly occur both in wetlands and outside wetland habitats with an estimated probability of 34 – 66% of being found in a wetland (Clarkson 2013). No exclusively wetland species (OBL) or facultative wetland species (FACW) occurred in either Plot 1 or Plot 3. Both Plots 1 and 3 also returned a prevalence index of 3 (Plot 3) or very close to 3 (Plot 1). This is the threshold for wetland delineation with values above 3 being classed as non-wetland. All plots supported limited number of species (5 -6) and all were common facultative exotic pasture species except for water celery (OBL) and kahikatea (FACW) in Plot 1. The soils are described in the Geotechnical report as “containing a saturated surface mantle” of silty alluvial soils. Ground Consulting Ltd consider the local hydrology of the site may be related to the topographically raised pond situated upslope and adjacent to the north west.

The area surrounding Plot 2 which was dominated by water celery was mapped using GPS as this clearly had wetland characteristics (Figure 10). Its area is c. 1100m². Other areas surrounding Plot 1 and 3 were also mapped, however these were more characteristic of damp pasture with creeping buttercup (*Ranunculus repens*) and Yorkshire fog (*Holcus lanatus*) being the dominant species. It is also significant that these two species are generally ignored by grazing cattle leading to their dominance in intensively grazed damp pasture. Other small areas similar to these were present on the western side of the main



Tutaenui Stream at 242 Station road and 27 Yates Road (Figure 14) with the total area of wet pasture mapped at c. 8274m². The total area with wetland hydrology was mapped at 1280m² (Figure 10).



Figure 12 Plot 1 herb layer dominated by buttercup and Yorkshire fog





Figure 13 Plot 2 herb layer dominated by water celery and tree layer with kahikatea.

Conclusions: Plot 2 meets the requirements in terms of the vegetation present and the hydrology. Other areas are dominated (100%) by facultative exotic pasture species and would be excluded under the NPS-FW definition. For Plots 1 and 3 the prevalence index threshold is barely met under the wetland delineation vegetation protocols and the species present are common exotic pasture species. Plots 1 and 3 are excluded as being dominated more than 50% by exotic pasture species. The wetland area delineated around Plot 2 and that identified immediately south of the pond (Figure 14) are judged to be induced wetlands due to the influence of the raised artificial pond on the hydrology of these areas. Under the most recent advice from the Ministry for the Environment³ these areas are still captured by the definition for “natural wetland”. Seepage from the raised pond is likely to be contributing to surface water ponding at the base of the bund, resulting in the current wetland areas observed. While more extensive natural wetlands may have existed here in the historic past, land modification since at least 1961 has resulted in their loss.

³ Essential Freshwater Interpretation Guidance: Wetland definitions (Exposure Draft circulated 7th April 2021 – Not Final Guidance.)



Areas meeting the definition of natural wetland under the NES-FW and most areas of damp pasture along the Tutaenui Stream are captured in the proposed Open Space reserve.

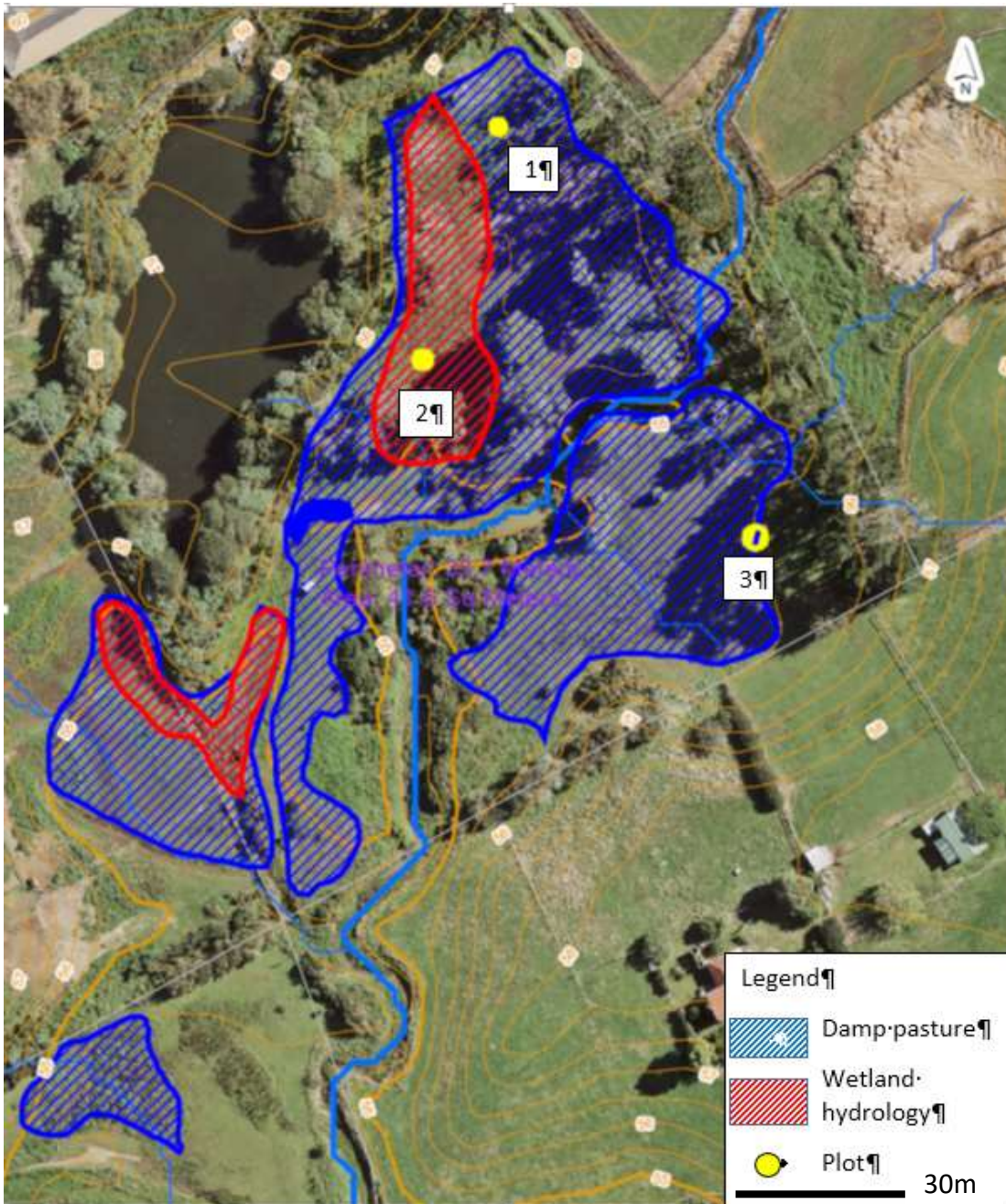


Figure 14 Location of plots for wetland delineation and mapping of areas of damp pasture and wetland hydrology



6.1.4 Ponds

Two ponds are located on the site, one on a small tributary of the upper Tutaenui Stream and a larger pond just west of the lower Tutaenui Stream (Figure 15).

The upper pond (c.450m²) is online to a small tributary of the Tutaenui Stream and it is fed by a small spring and artificial drains. Its purpose is stormwater detention (J Street pers comm). Its outlet is to a tile drain that runs cross country for c. 200m to the upper Tutaenui Stream (Figure 14). The pond and upper drains have very low aquatic values with sparse riparian vegetation of low pest plants and rough pasture. The original watercourse has been reclaimed so that no natural stream remains below the pond. The pond is probably not degrading the water quality of the Tutaenui Stream to any appreciable degree under the current circumstances.



Figure 14

Upper pond at 152 Golding Road



The lower pond (c. 0.3ha) is also fed by springs and its purpose appears to be for water supply. Its edges are vegetated with planted natives and a significant component of larger pest plants including crack willow (*Salix fragilis*), pussy willow (*Salix cinerea*), woolly nightshade (*Solanum mauritianum*), gorse (*Ulex europaeus*) and pampas (*Cortaderia selloana*). It is used by ducks. The ecological values of the pond are low. Its overflow is to the lower Tutaenui Stream, however under the current regime it is probably not degrading the water quality of the stream to any appreciable degree.



Figure 15 Lower pond at 240 Station Road

An equestrian aquatic exercise pool is located next to the Tutaenui Stream and this is likely to be inputting water of poor quality to the stream from time to time.

6.1.5 Aquatic fauna

Incidental observations of aquatic fauna yielded a single sighting of one eel (*Anguilla* spp.) in a small pool beside Golding Road just below the culvert under the road. Pest fish were not seen, however mosquito fish (*Gambusia affinis*) would likely be present during the warmer



months. Other pest fish such as koi carp (*Cyprinus rubrofuscus*) could be present in the artificial ponds but were not observed.

6.1.6 Fish passage

A large 1500mm culvert on the Tutaenui Stream where it runs under Golding Road is perched at the lower end. There are three more culverts and crossings on the upper Tutaenui Stream along the straightened and channelized reaches which were not specifically investigated as access was not available. These culverts will be removed as part of the development. A culvert under a farm crossing on the lower Tutaenui was full of water and its status for fish passage at low flows could not be determined.

The upper eastern tributary is conveyed under Golding Road by a small diameter (c. 200mm) PVC pipe which is perched. Above the road the stream appears to be ephemeral however.

It is safe to assume that at least some of the culverts on the Tutaenui Stream will be perched to some degree, however the very gentle gradient along the channelized parts means that fish passage may not be significantly compromised for the species most likely to be present (eels, banded kokopu, common bully) which tend to be competent climbers. The presence of an eel in a pool beside Golding Road above the project boundary supports this assumption.

6.2 Summary of Freshwater values

The site is crossed by two low elevation permanent streams and two main intermittent tributaries. Several smaller intermittent tributaries feed into the main Tutaenui Stream and these are generally degraded through livestock access leading to high sediment and nutrient inputs, and lack of riparian shading. There are at least five stream crossings on the main stream consisting of culverts and bridges. The Tutaenui stream and its tributaries are largely straightened and channelized. The flat to gentle contour results in generally minor barriers to fish passage despite multiple crossings.

Riparian vegetation over the majority of the site is either absent or restricted to a narrow band of less than 5m in width. The upper Tutaenui Stream is fenced off from livestock, however the lower stream is grazed and badly pugged. Tributaries are generally grazed.



The eastern tributary to the Tutaenui Stream is mostly grazed except for a fenced off section across 158 Golding Road.

Water quality values within the wider Pukekohe–Paerata area have been assessed as being low due to turbidity and sediment load, warmth, homogeneity of depth and high levels of nutrients and pollutants (Sinclair 2019). Water quality at the PPC site was assessed as being low to moderate. Two ponds are off-line to the main stream and are probably not significantly degrading water quality, however their ecological values are low and there are no ecological reasons for retaining them.

Eels were observed within the upper Tutaenui stream and other common native fish species such as common bullies and koura may also be present in the lower stream within the forest remnant.

Lengths of permanent and intermittent streams and pond areas were determined from Auckland Council Geomaps hydrology layer as shown in Tables 3 and 4 below.

Table 3 Length of permanent and intermittent streams for the PPPC site

Stream type	Length of open stream/m	Length of piped stream/m	Total length of stream/m
Permanent	1,632	-	1,632
Intermittent	943	205	1,148

Table 4 Area of ponds and wetland at the PPPC site

Habitat type	Area of pond or wetland/m ²
Mapped wetland	1280
Ponds	3450

A total 1280m² of induced wetland habitat was identified through wetland delineation protocols set out in the National Policy Statement for Freshwater and the National Environmental Standards for Freshwater (2020). Areas of damp pasture not meeting the wetland definition were found between the large raised pond and the Tutaenui Stream at 140 Station Road.



A specific stream ecological values (SEV) survey has not been undertaken for the PPC site as yet. However SEV values are available from an earlier council report (4Sight 2018) for one site on the channelized and straightened reach of the mainstem of the upper Tutaenui Stream (Figure 6). This site is identified as SEV Site 2 in that publication. SEV results for SEV Site 2 are shown in Table 5

Table 5 Summary of mean SEV scores for the upper Tutaenui Stream

	Hydraulic	Bio-geochemical	Habitat Provision	Biodiversity	Total SEV Score
SEV value	0.49	0.25	0.19	0.16	0.29
Overall rating	Moderate	Poor	Poor	Low	Poor

Each score is a rating out of a possible 1.

Hydraulic function includes natural flow regime, floodplain effectiveness, connectivity for migratory aquatic species and connectivity to groundwater. These values are related to degree of channelization of the watercourse, barriers to fish passage such as culverts and other physical attributes.

Biogeochemical parameters include water temperature control, dissolved oxygen levels, organic matter input, instream particle retention and decontamination of pollutants. These factors are related to the degree of riparian shading, macrophyte growth, stream morphology and nutrient enrichment.

Habitat provision includes the amount of fish spawning habitat and habitat values for aquatic fauna. It is influenced by stream morphology and flows, riparian vegetation, water quality and bank stability.

Biodiversity values include riparian shading and the intactness of fish fauna and invertebrate fauna. It is influenced by the number and type of fish species present, the number and type of invertebrate species and the quality and type of riparian vegetation community.

The SEV scores for the upper Tutaenui Stream (0.29) are well below the Auckland Council mean reference scores for rural streams (0.63), reflective of the degraded ecological and functional values of the watercourse. The watercourse through this reach has been identified as highly modified and suffering from persistent erosion issues resulting in fine sediment accumulation. It lacks any significant stands of riparian vegetation.



Overall observed values for the watercourses within the PPC site boundary as recorded during the ecological site assessment by JS Ecology are presented in Table 6. Channel modification refers to straightening, deepening or culverting. Habitat heterogeneity refers to the variety of habitat including pools runs and riffles. Channel modification has been calculated using the length of channel modification as a percentage of total channel length at the site.

Table 6: Observed values for permanent and intermittent watercourses within the PPC boundary

Watercourse	Upper mainstem	Lower mainstem	Main eastern tributary	Intermittent streams
Value	Tutaenui	Tutaenui		
Relative water clarity/turbidity	Moderate	Low	Low	Low
Instream macrophytes	Moderate	High	High	High
Bank stability	Poor	Poor	Moderate	Poor
Riparian shading	Poor	Poor	Poor	Poor
Aquatic habitat heterogeneity	Low	Low	Low	Low
Fencing	Good	Poor	Partial	Poor
% Channel modification	100	10	50	90

Overall ecological values for the watercourses at the site are generally low.



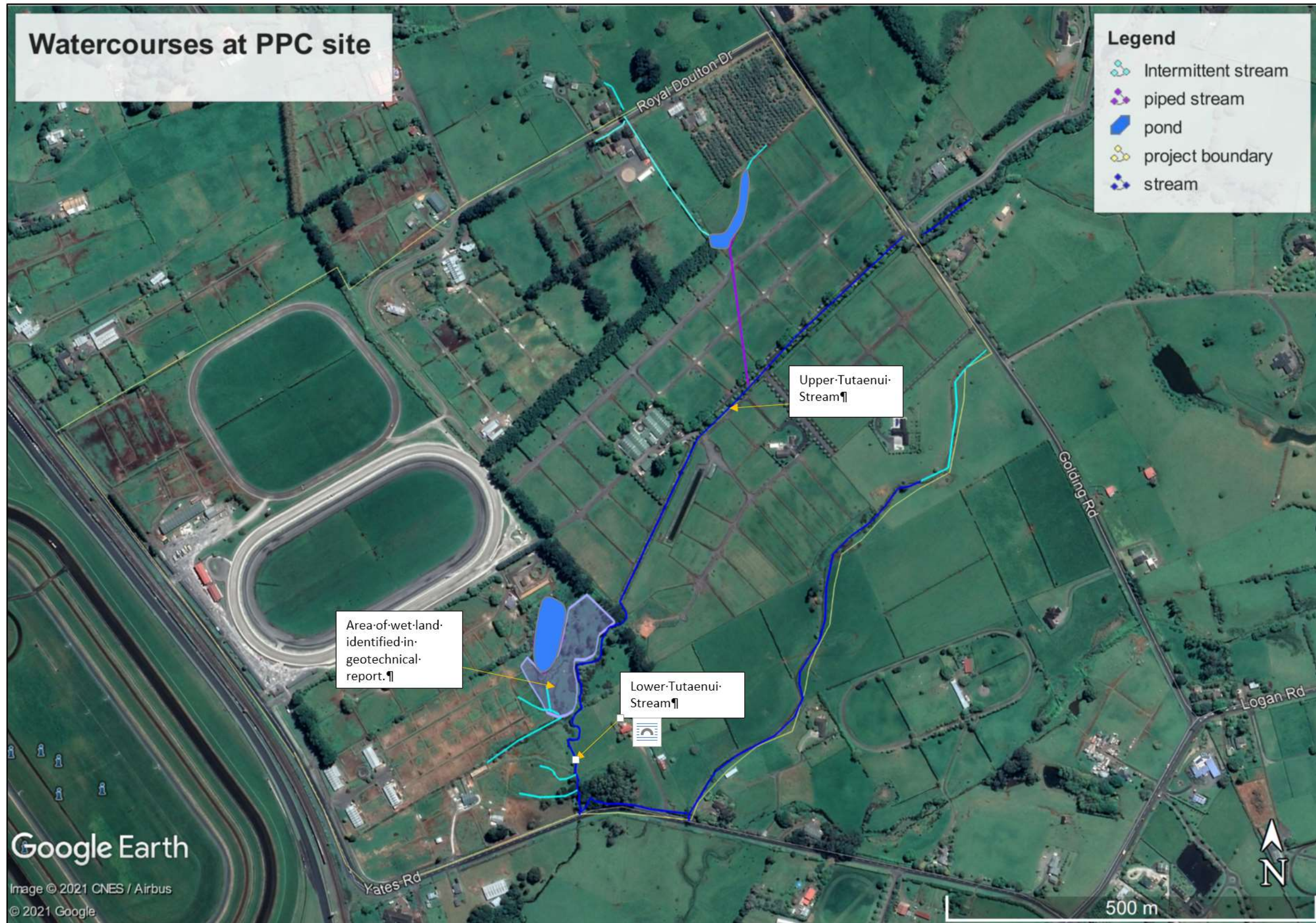


Figure 16 Permanent and intermittent watercourses and ponds.

6.3 Botanical Values

6.3.1 Native vegetation

Remnant forest

An area of remnant native forest lies on the southern side of the site at 47 Yates Road where the Tutaenui Stream flows under the road includes a small area (0.33ha) of continuous canopy forest on the true left bank of the stream that is partially fenced (Figure 17). The dominant canopy species is kahikatea (*Dacrycarpus dacrydioides*) which are 25 – 30m in height. Other species represented are pukatea (*Laurelia novaezelandiae*), rimu (*Dacrydium cupressinum*), karaka (*Corynocarpus laevigatus*), matai (*Prumnopitys taxifolia*), tawa (*Beilschmiedia tawa*), titoki (*Alectryon excelsus*) and rewarewa (*Knightia excelsa*). In the understorey are numerous sapling and seedling karaka, silver fern (*Cyathea dealbata*), mahoe (*Melicytus ramiflorus*), mapou (*Myrsine australis*), mamaku (*Cyathea medullaris*), cabbage trees (*Cordyline australis*), karamu (*Coprosma robusta*). Native groundcover plants include kiokio (*Parablechnum novae-zelandiae*), rautahi (*Carex geminata*), pukio (*Carex secta*) and basket grass (*Oplismenus hirtellus* subsp. *imbecilis*).

Amongst this stand of forest are numerous pest plants including Chinese privet (*Ligustrum sinense*), periwinkle (*Vinca major*), Japanese honeysuckle (*Lonicera japonica*), blackberry (*Rubus fruticosus*), gorse (*Ulex europaeus*) and others. Unfortunately rubbish bags have been dumped in the edges of this remnant and what appears to be a complete lounge suite.

The botanical values of this small forest stand are high when considered in the context of the wider site and the landscape beyond, which is depauperate of native vegetation. Despite the presence of pest plants, it has the ability to provide habitat for a range of native fauna terrestrial fauna including birds, invertebrates and potentially native bats. The vegetation type is kahikatea, pukatea forest (WF8) as described by Singers et al (2017). This forest type has an IUCN⁴ threat rating of “Critically Endangered” brought about mainly by drainage for agricultural land development. Historic aerial photographs show that the extent of this remnant has not changed over the last 70 -80 years. The area would meet the Significant Ecological Area criteria.

⁴ International Union for the Conservation of Nature.



Figure 17 Kahikatea remnant at 47 Yates Road with regenerating understorey.

To the west of the main forest fragment at 27 Yates Road are small stands and individual remnant native trees standing in wet, heavily grazed and pugged pasture (Figure 18). These are mostly kahikatea, some in better health than others and ranging in height from 16 -30m. Some trees exhibit significant dieback and defoliation and all have had their roots trampled. An attractive and healthy stand of six tall podocarps (Kahikatea, rimu, matai) is fenced off beside the house at 27 Yates Road. These mature native trees all have high ecological values since they have the ability to recover their health if protected from livestock. Individual large trees have high ecological values as nesting sites and food sources for native birds, refugia for native invertebrates and seed sources. The forest type is “native—dominated treeland” (TL1) as defined by Singers et al (2017), an anthropogenically induced vegetation type.





Figure 18 Relict kahikatea trees standing in a wet paddock at 27 Yates Road. The main kahikatea remnant is seen in the background.

A northern area of kahikatea treeland is located in the south eastern corner of 240 Station Road on the Auckland Trotting Club property (Figure 19). Here there are c. 30 trees standing in wet pasture. Of similar height to the trees to the south these trees also exhibit significant dieback and defoliation and have had their roots trampled. These mature native trees all have high ecological values since they have the ability to recover their health if protected from livestock. This vegetation is also “native—dominated treeland” (TL1) as for the vegetation on 27 Yates Road.





Figure 19 Relict kahikatea trees standing in grazed pasture at 240 Station Road.

Other native vegetation

Other native vegetation at the site is restricted to individual relict trees (Figure 20), planted native shelterbelts and amenity vegetation, or scattered native plants regenerating on the steep banks of the channelized western drain. Planted vegetation includes a tarata (*Pittosporum eugenioides*) shelterbelt on the southern side of the driveway of 240 Station Road (Figure 20), cabbage trees, young totara, titoki, kahikatea and lacebark surrounding the southern pond on the same property. Individual mature native trees have high botanical values as nesting sites and food sources for native birds, refugia for native invertebrates and seed sources. Planted native vegetation has moderate ecological values.



6.3.2 Exotic vegetation

Planted exotic shelterbelts, orchards and amenity vegetation

Exotic vegetation at the site includes horticulture, planted shelterbelts, amenity vegetation and invasive pest plants. A c. 1.6ha olive orchard is found at 17 Royal Doulton drive. A number of shelterbelts are found throughout the site and these are chiefly mature Monterey pines (*Pinus radiata*), mature poplars (*Populus deltoides*) and Tasmanian blackwood (*Acacia melanoxylon*). Amenity vegetation including exotic tree species is found lining driveways and surrounding houses. Some of this is mature and some is relatively recently planted. Pest plants are found along the upper and lower Tutaenui Stream and the main western drain. Mature exotic trees contribute to riparian shading at the site and a variety of exotic amenity plants provide food and nest sites for native birds. Large mature pine trees are known to provide roost sites for endangered native bats, however the trees have not been assessed for bat roost potential. Exotic vegetation at the site has moderate ecological values.

Pest plants

There are numerous pest plants surrounding the southern pond, the lower Tutaenui Stream and along the western drain. Pest plants are mostly confined to a narrow band along these waterways however. Species include Chinese privet, tree privet, blackberry, woolly nightshade, Japanese honeysuckle, pampas, pussy willow and crack willow.





Figure 20 Key vegetation features of the PPC area.

6.4 Terrestrial fauna values

6.4.1 Birds

Native birds observed at the site were white faced heron (*Egretta novaehollandiae*) and grey warbler (*Gerygone igata*) in or close to the kahikatea remnant. Other common native birds such as tui (*Prosthemadera novaeseelandiae*), wax eye (*Zosterops lateralis*), kingfisher (*Todiramphus sanctus*) and fantail (*Rhipidura fuliginosa*) can be expected to frequent the wider site seasonally depending on food resources. None of these species is threatened.

6.4.2 Lizards

Habitat for native lizards across the site is limited and there is very little suitable habitat for any of the more commonly encountered arboreal geckos. It is unlikely that species such as the green gecko (*Naultinus elegans*) and the forest gecko (*Mokopirirakau granulatus*) inhabit any part of the site. The only species for which some habitat exists is the copper skink (*Oligosoma aeneum*). Copper skinks inhabit areas of rank grass and weedy areas and are commonly found in domestic gardens. Areas with debris are also important so that skinks can take refuge from native predators such as kingfishers and introduced predators such as rats. Copper skinks currently have a conservation status of “Not Threatened”.

Formal lizard surveys by a specialist herpetologist have not been undertaken as yet but these would be a necessary part of detailed investigations associated with the resource consent process. Key lizard habitat along the Tutaenui Stream is captured within the proposed reserve area along the Tutaenui Stream.

6.4.3 Bats

Long tailed bats (*Chalinolobus tuberculatus*), are known to be present in the local area (S Sinclair 2019). Long-tailed bat surveys undertaken by the Auckland Council at nearby Mauku, Puni and Patumahoe have all detected small numbers of bats. A bat survey of the Southwest Franklin and Awhitu Area was undertaken by Bioreserches Group Ltd for the Auckland Council in 2016 (Bioreserches 2016). The study detected strong bat activity in the Pukeoware/Bald Hill Road area and low and sporadic bat activity in the Patumahoe area. No bats were detected for Awhitu. The general area around Bald Hill Road contains a series

of old growth forest remnants that would provide good bat habitat. The Patumahoe area also contains several good quality native forest remnants.

Bats feed on the wing for flying invertebrates and often forage near streams and wetlands where invertebrate life is more abundant. A distribution model developed by the council to map the locations that bats are likely to be present indicates that there are riparian habitats along the Tutaenui Stream within the PPC site that are highly suitable for long-tailed bats. These areas of potentially suitable habitat are very small however. Bats may travel up to 19km between roost sites and foraging areas (Borkin and Parsons 2009).

Long tailed bats are classified as 'Threatened- Nationally Critical' (O'Donnell et al. 2017) and are protected under the Wildlife Act 1953. Given their very high threat status, areas that provide habitat to long-tailed bats are considered to be significant habitats under s 6(c) RMA 1991.

Bats are dependent on roosting cavities with specific micro-climates, which are typically rare in landscapes. They roost in cavities in mature trees and in the absence of suitable native trees, do use exotic tree species. They require large trees (including exotic and standing dead trees) with cavities (e.g. knot holes, hollows).

No surveys have been undertaken to detect bats at the site as yet, however the PPC area is relatively depauperate of native forest patches that would provide good bat habitat.

Site specific bat surveys would be undertaken as part of resource consent application process. Roost trees are potentially present at the site within remnant kahikatea forest, individual mature native trees and potentially early mature pine shelterbelts. Mature indigenous trees that may be suitable for bat roosts are mainly captured within the proposed reserve area along the lower Tutaenui Stream.



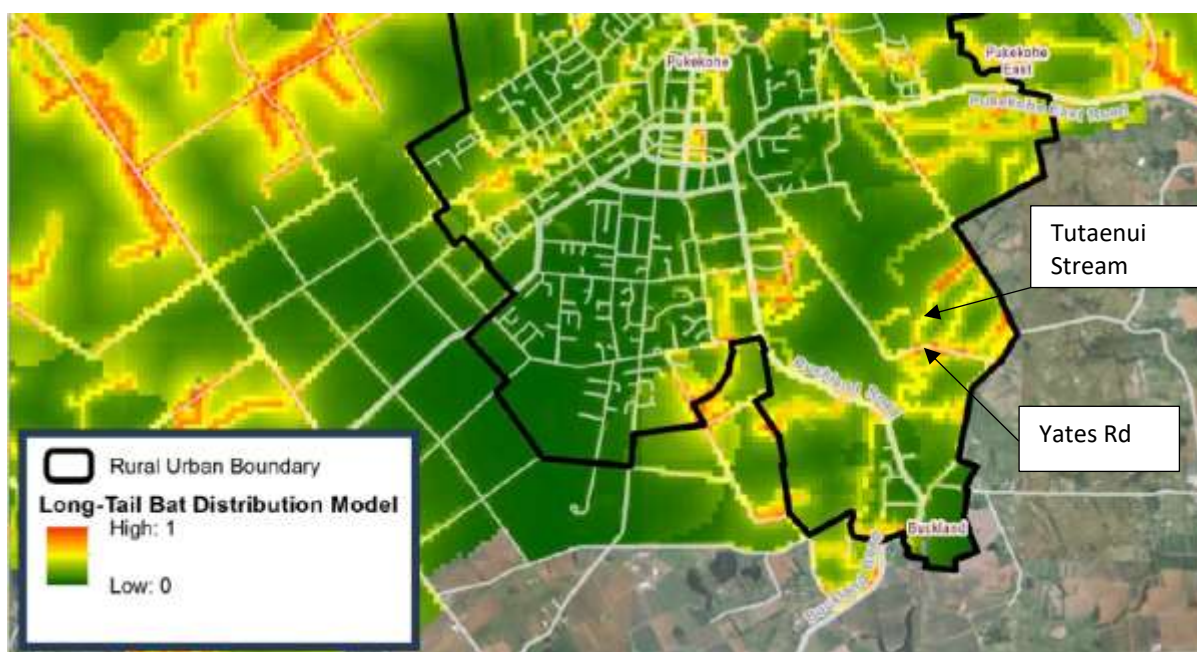


Figure 21 Long-tailed bat distribution model identifying sites likely to host bats in the Pukekohe Paerata RUB area (excerpted from the Ecology report for the Pukekohe – Paerata Structure Plan.

6.5 Summary of terrestrial ecological values

The only area of reasonably intact native vegetation is the small (c. 0.33ha) remnant of kahikatea, pukatea forest (WF8) at 47 Yates Road. This has high ecological value and the forest type has an IUCN⁵ conservation rating of “critically endangered” (Singers et al 2017). It meets Criterion 2(a) for an SEA as set out in Schedule 3 - Significant Ecological Areas (Terrestrial Schedule) of the AUP-OP (see Appendix 1).

Two other small areas of “native—dominated treeland” (TL1) occur at 27 Yates Road (c. 0.2ha) and 240 Station Road (c. 0.5ha). Singers et al do not give a threat rating for this vegetation type, however mature native trees have high ecological values. At least six mature totara and kahikatea trees dotted about the site also have high ecological values. Historic aerial photographs show that the remnant vegetation and relict trees adjacent to Yates Road have not altered significantly in extent over the past 70 -80 years, however there has been loss of vegetation along the lower Tutaenui Stream at 240 station Road and 156 Golding Road where the stream has been channelized and straightened.

⁵ International Union for the Conservation of Nature



Other native and exotic woody vegetation such as shelterbelts and amenity planting has moderate ecological values as habitat and roosts for common native birds. Large areas of intensively grazed pasture and occurrences of pest plants have very low ecological values.

At least six common native bird species were observed or can be expected to utilise the site. The only lizard species likely to be present is copper skink. The only native fauna species with a conservation status of “Threatened” that could potentially utilise the site is long tailed bats (Threatened- Nationally Critical). No fauna surveys have been undertaken as yet.

7 ASSESSMENT OF EFFECTS OF POTENTIAL CHANGES IN LAND USE ON ECOLOGICAL VALUES

7.1 Assessment of the overall scale of ecological effects

7.1.1 Key ecological values

The key ecological values of the site lie mainly with the watercourses and remnant native trees. Current and historic landuse has resulted in loss of riparian vegetation and destructive modification of watercourses. As a consequence aquatic habitat values and water quality are generally poor throughout the site. Elements of the original native aquatic ecosystems are still present or potentially present however. The proposed overall design for the site indicates that the permanent streams will be retained and enhanced. Artificial open watercourses (drains) with low ecological values on the western side of the site may be piped. An intermittent tributary of the Tutaenui Stream that has been dammed and partially piped for some 40 years may be fully piped.



Native vegetation at the site is relatively sparse with only a one small area of mature native trees and a few individual mature trees scattered about amongst pasture. The remnant forest has a threat status of “Critically Endangered” however and individual mature native trees or treeland have high ecological values. Early design planning indicates that areas of native vegetation and remnant trees will be retained.

It is expected that neutral effects on the hydrology of the site will be achieved through careful engineering design. Urban development of the site may result in the loss of one small, partially piped degraded tributary of the Tutaenui Stream.

7.1.2 Assessment of the magnitude of effects

The scale of ecological effects can be evaluated at a high level using criteria matrices contained in the Environmental Institute of Australia and New Zealand (EIANZ) guideline document Ecological Impact Assessment (EclA): EIANZ guidelines for use in New Zealand terrestrial and freshwater ecosystems (Roper-Lindsay et al 2018). While detailed assessments of aquatic ecological values have not been undertaken as yet, the degraded nature of aquatic habitats within the Pukekohe-Paerata Structure Plan area is acknowledged (Sinclair 2019). The ecological assessment undertaken by JS Ecology has confirmed that terrestrial ecological values and aquatic habitat values are generally low.

Table 7 below is taken from the EIANZ guidelines. It sets out a criteria matrix for assessing the magnitude of ecological effects of an activity. The magnitude of effects can be assessed at a high level only since detailed stream ecological values (SEV) assessments and fauna surveys have yet to be undertaken and this would normally occur at the resource consent application stage.



Table 7 Criteria matrix for describing magnitude of effects (Roper-Lyndsay et al. 2018)

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

The magnitude of effects is expected to be moderate - low for freshwater values. Loss of mature shelterbelts and other three-dimensional habitat for native fauna would represent a moderate ecological effect unless these were found to contain bat roosts. If bats were



present this would place very high ecological values on any existing bat roost trees. It is acknowledged however that it is a permitted activity under the AUP to remove the shelterbelts as they are not located within 10m of an urban stream.

The assessment of the proposed activity against Table 7 is shown in Table 8 below. It assumes that no bat roost trees are present amongst the exotic shelterbelts pending investigations later in the resource consent process (and given the permitted activity status for removal under the AUP).

Table 8 Assessment of the magnitude of ecological effects of the proposed Golding Meadows development

Magnitude	Description
Very High	
High	
Moderate	Loss or alteration to one tributary stream (e.g. culverting, concrete channelling) but retention of main permanent streams. Loss of mature shelterbelts and other woody vegetation. Post-development character, composition and/or attributes will be partially changed.
Low	
Negligible	

The magnitude of ecological effects is assessed as “moderate” when changes to both freshwater and terrestrial values are considered.

7.1.3 Assessment of level of effects

Table 9 below is taken from the EIANZ guidelines. It sets out a criteria matrix for assessing the level of ecological effects of an activity based on the ecological values and the magnitude of effects. Ecological values have been assessed as low for the site as a whole and the magnitude of effects as moderate.

Table 9 Criteria matrix for describing level of effects (Roper-Lyndsay et al. 2018)



	Very High	High	Moderate	Low	Negligible
Ecological Value → Magnitude ↓					
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

The level of ecological effects is expected to be “low” based on the current assessment.”

7.2 Potential ecological effects of changes to land use

7.2.1 Potential adverse impacts

A change in land use from the existing agricultural uses to more intensive residential and/or industrial use could potentially result in the following adverse environmental impacts:

Potential adverse ecological effects of development

1. An increase in impervious surfaces associated with buildings and roading infrastructure could result in alterations to the quantity, quality and rate of flow of stormwater to watercourses within the upper Tutaenui Stream catchment.
2. Runoff from urban or light industrial areas could result in an increase in pollutants such as heavy metals, hydrocarbons, nutrients and particulates entering waterways.
3. Disturbance caused by earthworks at the site has the potential to affect the water quality of downstream receiving environments such as the lower Tutaenui Stream and the Waikato River.
4. One degraded intermittent stream may be culverted along all or parts of its length resulting in loss of opportunity to rehabilitate aquatic habitat.
5. Modifications to the natural landforms including road construction, and



stormwater retention devices, particularly close to watercourses can result in loss of connectivity between streams and their catchment.

6. Small fragments of native forest and individual mature native trees may be removed potentially resulting in loss of habitat for native birds, bats and lizards.

7 There may be a permanent or temporary overall loss of woody vegetation from the site resulting in a loss of habitat values.

7.2.2 Potential biodiversity benefits of development.

A number of opportunities exist to improve the biodiversity values of the site and contribute to the wider ecological values of the landscape:

Opportunities to improve biodiversity values

1. The removal of grazing livestock and cessation of agricultural activities at the site is likely to have generally beneficial effects on the water quality and aquatic habitat values of the watercourses at the site through a reduction in pugging of soils, stream bank disturbance and nutrient inputs.
2. Areas of degraded kahikatea tree land in the lower catchment of the Tutaenui Stream have the potential to be restored to greater functionality and naturalness through restoration planting following livestock removal.
3. There is opportunity to repatriate the channelized reaches of the Tutaenui Stream and reintroduce sinuosity and heterogeneity of habitats e.g. pools, runs and riffle habitat.
4. There is opportunity to remove barriers to fish passage and ensure all new infrastructure is designed to enable long term fish passage.



5. There is opportunity to undertake riparian planting of major streams and tributaries to improve habitat connectivity, aquatic habitat quality and natural inputs of organic matter.
6. The two ponds could be removed as their ecological values are low.
7. Stormwater infrastructure can be designed to incorporate water sensitive design principles such as the use of wetlands.

7.2.3 Relevant policy documents

National Policy Statement for Freshwater Management 2020

Part 2: Objectives and policies

Policy 1(a): prioritise the health and wellbeing of waterbodies and freshwater ecosystems

Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

Policy 9: The habitats of indigenous freshwater species are protected.

The proposed PPC supports these objectives and policies through protection and restoration of wetland and riparian habitats and provides scope for recreation of wetland habitat.

Draft National Policy Statement on Indigenous Biodiversity

Objective 5: to restore indigenous biodiversity and enhance the ecological integrity of ecosystems:

Policy 7: to manage subdivision, use and development outside SNAs as necessary to ensure indigenous biodiversity is maintained.

The proposed PPC supports these objectives and policies through proposed retention of all areas native vegetation and the restoration of native riparian vegetation along natural stream corridors to re-establish native ecosystem connectivity across the landscape.



8 RECOMMENDATIONS

8.1 Impact management

The effects management hierarchy is consistent with the Resource Management Act (1991) and follows key principles set out in EIANZ guidelines for Ecological Impact Assessment.

The effects management hierarchy

Where impacts are predicted to result from a development the effects management hierarchy is used to address these predicted impacts in a systematic way using the effects management hierarchy as follows:

1. Avoid
2. Remedy
3. Mitigate
4. Offset
5. Compensate
6. Supporting actions

Impact management approaches should be implemented sequentially, with avoidance measures assuming priority:

- Avoiding the impact altogether, by modifying design or operations or seeking an alternative location.
- Minimising the impact by limiting the degree or magnitude of an action, or implementing best practice treatment of controls to minimise impact.
- Rectifying impacts through repair, reinstatement or restoration of the receptor site.
- Offsetting residual impacts by replacing or enhancing substitute resources or environments.
- Compensating for the impact by providing substitute resources for implementation elsewhere or for a different purpose.



8.2 Freshwater ecology impact management

8.2.1 Recommendations of the ecology report for the Pukekohe-Paerata Structure Plan

Summarized below are the recommendations made in the ecology assessment for the Pukekohe-Paerata Structure Plan for protection and enhancement of watercourses:

SPECIFIC FRESHWATER ECOLOGY RECOMMENDATIONS	HOW/WHERE THE ITEM IS ADDRESSED
1. Avoid any loss of wetted habitat, enhance and increase wetted habitat as a primary principle.	<p>The following already provide for the protection of wetted habitat:</p> <ul style="list-style-type: none"> • National Policy Statement for Freshwater Management; • National Environmental Standards for Freshwater; and • Existing AUP provisions in Chapter E3 (lakes, rivers, streams and wetlands) and E15 Vegetation <p>The PPC also seek to insert a new objectives, policies and methods to require riparian planting for streams (meeting the AUP definition of permanent and intermittent) and wetlands.</p>
2. Retain all orders of watercourses i.e. including tributaries whether perennial or intermittent. Protect overland flow paths so that intermittent watercourses remain.	
3. Retain natural topography to promote ground water recharge and natural watercourse form.	<p>This is achieved through:</p> <ul style="list-style-type: none"> • Healthy Water’s Network Discharge Consent • The SMP prepared for the Golding Road PPC has taken into account the best practicable options for SW management (which are also included as specific rules in the proposed Precinct)



<p>4. Require best practice stormwater design that contains stormwater soakage on site per lot.</p>	<p>This is achieved through:</p> <ul style="list-style-type: none"> • Healthy Water’s Network Discharge Consent • The SMP prepared for the Golding Road PPC has taken into account the best practicable options for SW management (which are also included as specific rules in the proposed Precinct)
<p>5. Introduce and integrate wetland and riverine elements into developments and use these spaces as opportunities for providing green corridors and recreational walkways and linkages.</p>	<p>Interaction between future development and future green linkages is a resource consent stage matter. Not all areas will necessarily be vested with Council (as this is dependent on Council’s desire to ultimately be the owner of such spaces). The existing AUP E38 Urban Subdivision objectives, policies and discretions adequately provide for this and no specific rules are need in the PPC.</p>
<p>6. Require fencing and planting of riparian margins to a minimum width of 20m on both sides of watercourses.</p>	<p>A riparian planting margin of 10m is proposed in the PPC for the site which is consistent with the AUP-OP riparian yard requirements which have been implemented Auckland-wide, and which is consistent across all other Greenfield Precincts.</p>
<p>7. Keep development footprints outside of the natural flood plain, not only outside of the 1% AEP. Remove online ponds when subdivision provides opportunity.</p>	<p>This is achieved through:</p> <ul style="list-style-type: none"> • Chapter E36 (Natural hazards and flooding)



	<p>Removal of online pond works are likely to trigger specific consents under the Chapter E3 (lakes, rivers, streams and wetlands) for diversion, disturbance of streams etc. This PPC does not seek to alter the Regional Plan provisions of the AUP, nor is it considered necessary to do so. As such, this will be a consideration for future resource consents.</p>
<p>8. Seek repatriation of wetlands and modified watercourse channels to their natural state during development.</p>	<p>While protection and enhancement can be encouraged through the PPC Precinct objectives and policies, “repatriation” works would trigger specific consents under the Chapter E3 (lakes, rivers, streams and wetlands) for diversion. This PPC does not seek to alter the Regional Plan provisions of the AUP, nor is it considered necessary to do so. As such, this will be a consideration for future resource consents.</p>
<p>9. Protect spawning areas from modification and implement long term pest animal control.</p>	<p>This is achieved through: Chapter E3 (lakes, rivers, streams and wetlands). Strategies for pest control are not a PPC matter and can be addressed as needed through resource consent as this is dependent on final ownership of such land – as identified above, some areas may be vested to council. This is consistent with the other greenfield Precincts in the AUP.</p>
<p>10. Remove barriers to fish passage and ensure infrastructure design creates long term fish passage.</p>	<p>These matters are already addressed by:</p> <ul style="list-style-type: none"> • National Environmental Standards for Freshwater



	<ul style="list-style-type: none"> Chapter E3 (lakes, rivers, streams and wetlands)
11. Ensure any watercourses that form part of the PPSP area boundary are protected as per recommendations above.	None of the watercourses on-site form part of the PPSP area boundary.
12. Any works in watercourses to adhere to hygiene protocols to avoid spreading aquatic weed species.	The AUP Chapter E3 (Lakes, rivers, streams and wetlands) governs all matters relating to works in watercourses. No new specific rules are required or needed.
13. Map and delineate watercourses prior to developing any scheme plans or yield calculations to identify constraints and achieve maximum watercourse protection.	The watercourses on-site have been delineated as per Chapter J (Definitions) and mapped in the ecology report. Further, Chapter E3 (Lakes, rivers, streams and wetlands) and the NES – FW protect streams and wetlands. No further rules are considered necessary.

8.2.2 Specific recommendations for the Golding Meadows PPPC

As a result of ecological investigations at the site the following recommendations are made for the Golding Meadows PPC (and covers only those matters not already and specifically identified in section 8.2.1 above):

1. Wetlands: Restoration of areas of wet pasture and small wetlands in the lower Tutaenui Stream catchment at 240 Station Road, and 27 & 47 Yates Road that have the potential to be re-established as naturally functioning wetlands. The hydrology has been altered by past land use practices and the construction of the raised pond to the northwest. The restoration of natural hydrology would need to be carefully undertaken to preserve the health of the relict kahikatea trees here. It is likely areas of damp pasture would become kahikatea, pukatea forest and any wetter areas could be restored to wetland vegetation. Both of these ecosystem types are threatened in the Auckland Region. Exclusion of livestock will provide immediate benefits to the trees. Undertake restoration planting with native understorey



and groundcover plants that are appropriate to kahikatea, pukatea forest and to appropriate wetland types.

2. Watercourses:

(a) Restore the upper Tutaenui Stream to a more natural configuration with a sinuous channel and a series of pools runs and riffles. Ensure substrate materials are similar to the lower, natural part of the stream and other natural streams on the same geology in the area. This would provide improved aquatic habitats for native fauna. The stream channel would ideally be restored to its pre-channelization configuration (Figure 21) or as a minimum, something similar to the eastern tributary. There would also be opportunity to create small wetland areas.



Figure 22 Historical aerial photograph of the upper Tutaenui Stream at Golding Road (Retrolens).

While protection and enhancement can be encouraged through the PPC Precinct objectives and policies, “restoration” works would trigger specific consents under the Chapter E3 (lakes, rivers, streams and wetlands) for diversion. This PPC does not seek to alter the



Regional Plan provisions of the AUP, nor is it considered necessary to do so. As such, this will be a consideration for future resource consents.

(b) Planting of the riparian margins on both sides of the restored Tutaenui Stream and the True Right bank of the eastern tributary to a minimum width of 10m should be undertaken. Whilst the PPSP recommends a minimum width of 20m, 10m is the accepted planting width Auckland-wide and is consistent with both the 10m setback for buildings in residential zones from a stream and the 10m width planting required consistently across the Greenfield Precincts in the AUP. Riparian planting is an important conservation action to provide riparian shading and improve aquatic habitat values. Fencing is not specifically required since the area is to become urban and livestock will not be present, however this is a detail for resource consent stage.

8.3 Terrestrial Ecology

8.3.1 Recommendations of the ecology report for the Pukekohe-Paerata Structure Plan

Summarized below are the recommendations made in the ecology assessment for the Pukekohe-Paerata Structure Plan for protection and enhancement of terrestrial ecology values:

SPECIFIC TERRESTRIAL ECOLOGY RECOMMENDATIONS	HOW/WHERE THE ITEM IS ADDRESSED
1. Retention of all remnant forest patches	The only remnant forest patch on-site comprises 0.33ha of Kahikatea forest which has been assessed as meeting one or more of the factors that qualify terrestrial SEA. Its inclusion in the PPC as a SEA will ensure its ongoing protection.
2. Enhancement of remnant forest patches through buffer planting, creation of green corridors and pest control.	Buffer planting to the remnant forest is proposed and will be incorporated into the Golding Road Precinct.
3. New plantings should be aligned with the original vegetation types of either WF7	New planting will be guided by Appendix 16 (Guideline for native revegetation



puriri forest or WF9 taraire/tawa/podocarp forest as these are most suited for the soil types present. All plants are to be eco-sourced from within the Manukau Ecological District.	plantings) and best practice planting methods. No further methods are required by the PPC.
4. Newly planted areas should be protected in perpetuity either through covenants or vestment with Council.	This is a resource consent matter and not one that can be pre-determined at PPC stage.
5. Covenants must be maintained with adequate weed and pest animal control to ensure the establishment and survival of all native flora and fauna.	N/A.
6. Planting of watercourse margins to create a natural green corridor and allow for colonisation and/or movement of flora and fauna. Vegetated watercourse margins will also function to reduce nutrient and sediment runoff from surrounding land.	Riparian planting is addressed in the Golding Road Precinct provisions.
7. Mature tree species to be retained regardless of whether native or exotic to provide bat roosting habitat.	All mature trees on-site not identified to be qualified as a SEA will be managed by Chapter E15 (Vegetation management and biodiversity).
8. Retention of rank grass or low growing native vegetation to provide habitat for native skinks.	Covered by Chapter E15 (Vegetation management and biodiversity).

8.3.2 *Specific recommendations for the Golding Meadows PPPC*

As a result of ecological investigations at the site the following recommendations are made for the Golding Meadows PPC (and covers only those matters not already and specifically identified in section 8.2.1 above)



1. Remnant Kahikatea forest:

(a) Identify the 0.33ha of Kahikatea forest for scheduling in the AUP as a SEA meeting criterion 2(a) of schedule 3.

(b) Buffer planting of the kahikatea remnant with species appropriate to WF8 should be undertaken. Isolated forest patches suffer from a suite of adverse environmental effects known as “edge effects” which result in hotter, drier, windier conditions that can inhibit natural regeneration and exacerbate the effects of drought. Buffer planting involves planting a band (minimum 5m) of native shrubs and trees around the edge of the forest fragment to help seal the edge and create more natural interior forest conditions.

3. Ecological Corridors:

Both the Tutaenui Stream and its eastern tributary on the eastern boundary of the site should be protected and receive riparian planting, providing two ecological (green) corridors along the watercourses. The proposed corridors will provide important ecological connectivity across a highly modified landscape. Riparian planting can be appropriately addressed at resource consent stage.

4. Terrestrial fauna

Key habitats for native fauna are captured within the proposed reserve area along the Tutaenui Stream. Any specific fauna management plans that may be required will be developed at the resource consent stage following surveys to detect any lizards and bats.

9 CONCLUSIONS

The Golding Meadows Proposed Private Plan Change envisages developing the site for housing and light industry. This change in land use from predominantly rural activities to an urbanised landscape could have a range of ecological effects. These include:

- Clearance of non-native woody vegetation that is currently providing a range of ecological functions.
- Modification or loss of ephemeral watercourses.



- Construction of infrastructure and buildings resulting in land disturbance and ultimately a greatly increased area of impermeable surfaces which has the potential to negatively impact water quality and quantity for watercourses.
- Potential negative effects on native terrestrial and aquatic fauna

There is significant opportunity to rehabilitate and restore a range of ecological features of the site through:

3. Riparian restoration and protection of permanent and intermittent streams
4. Repatriation of highly modified and straightened streams to improve aquatic habitat values
5. Recreation of native riparian wetlands and native riparian forest.
6. Creation of ecological corridors across the site.
7. Water quality improvements achieved through sensitive stormwater design leading to reductions in sediment loadings and inputs of nutrients and pollutants to waterways.

Ecological values across the site are currently low and the magnitude of ecological effects would be moderate due to significant changes in land use and loss of mature exotic shelterbelts and other mainly exotic vegetation. The overall level of effects has been assessed in accordance with EIANZ guidelines and is found to be low.

Ecological effects, although not negligible can be addressed through the restoration and rehabilitation measures discussed above and in Section 8.

The PPC supports the relevant objectives and policies of the National Policy Statement for Freshwater Management 2020 and Draft National Policy Statement on Indigenous Biodiversity.



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APPENDIX 1 Schedule 3 Significant Ecological Areas – Terrestrial Schedule

Factors for assessing ecological value [rps]

An area shall be considered to have significant ecological value if it meets one or more the sub-factors 1 to 5 below. These factors are also referred to in B7.2.2(1).

These factors have been used to determine the areas included in Schedule 3 Significant Ecological Areas – Terrestrial Schedule, and will be used to assess proposed future additions to the schedule.

Factors:

(1) REPRESENTATIVENESS Sub-factor:

(a) It is an example of an indigenous ecosystem (including both mature and successional stages), that contributes to the inclusion of at least 10% of the natural extent¹ of each of Auckland's original ecosystem types² in each ecological district of Auckland (starting with the largest, most natural and intact, most geographically spread) and reflecting the environmental gradients of the region, and is characteristic or typical of the natural ecosystem diversity of the ecological district and/or Auckland.

(2) THREAT STATUS AND RARITY

Sub-factors:

(a) It is an indigenous habitat, community or ecosystem that occurs naturally in Auckland and has been assessed (using the IUCN threat classification system) to be threatened, based on evidence and expert advice (including Holdaway et al. Status assessment of NZ naturally uncommon ecosystems³).

(b) It is a habitat that supports occurrences of a plant, animal or fungi that has been assessed by the Department of Conservation and determined to have a national conservation status of threatened or at risk; or

(i) it is assessed as having a regional threatened conservation status including Regionally Critical, Endangered and Vulnerable and Serious and Gradual Decline.

(c) It is indigenous vegetation that occurs in Land Environments New Zealand Category IV where less than 20% remains.

(d) It is any indigenous vegetation or habitat of indigenous fauna that occurs within an indigenous wetland or dune ecosystem.

(e) It is a habitat that supports an occurrence of a plant, animal or fungi that is locally rare; or

(i) it has been assessed by the Department of Conservation and determined to have a national conservation status of Naturally Uncommon, Range Restricted or Relict.

(3) DIVERSITY Sub-factors:

(a) It is any indigenous vegetation that extends across at least one environmental gradient resulting in a sequence that supports more than one indigenous habitat, community or ecosystem type e.g., an indigenous estuary to an indigenous freshwater wetland.

(b) It supports the expected indigenous ecosystem diversity for the habitat(s).

(c) It is an indigenous habitat type that supports a typical species richness or species assemblage for its type.

(4) STEPPING-STONES, MIGRATION PATHWAYS AND BUFFERS Sub-factors:

(a) It is an example of an indigenous ecosystem, or habitat of indigenous fauna that is used by any native species permanently or intermittently for an essential part of their life cycle (e.g. known to facilitate the movement of indigenous species across the landscape, haul-out site for marine mammals) and therefore makes an important contribution to the resilience and ecological integrity of surrounding areas.

(b) It is an example of an ecosystem, indigenous vegetation or habitat of indigenous fauna, that is immediately adjacent to, and provides protection for, indigenous biodiversity in an existing protected natural area (established for the purposes of biodiversity protection); or

(i) it is an area identified as significant under the 'threat status and rarity' or 'uniqueness' factor. This includes areas of vegetation (that may be native or exotic) that buffer a known significant site. It does not include buffers to the buffers.

(c) It is part of a network of sites that cumulatively provide important habitat for indigenous fauna or when aggregated make an important contribution to the provision of a particular ecosystem in the landscape.

(d) It is a site which makes an important contribution to the resilience and ecological integrity of surrounding areas.

(5) UNIQUENESS OR DISTINCTIVENESS Sub-factors:

(a) It is habitat for a plant, animal or fungi that is endemic to the Auckland region (i.e. not found anywhere else).

(b) It is an indigenous ecosystem that is endemic to the Auckland region or supports ecological assemblages, structural forms or unusual combinations of species that are endemic to the Auckland region.

(c) It is an indigenous ecosystem or a habitat that supports occurrences of a plant, animal or fungi that are near-endemic (i.e., where the only other occurrence(s) is within 100km of the council boundary).

(d) It is a habitat that supports occurrences of a plant, animal or fungi that is the type locality for that taxon.



(e) It is important as an intact sequence or outstanding condition in the region.

(f) It is a habitat that supports occurrences of a plant, animal or fungi that is the largest specimen or largest population of the indigenous species in Auckland or New Zealand.

(g) It is a habitat that supports occurrences of a plant, animal or fungi that are at (or near) their national distributional limit.

