



ATTACHMENT B
WILDLAND CONSULTANTS REPORT

**ECOLOGICAL ASSESSMENT OF WATERWAYS
WITHIN TE PUNA SPRINGS ESTATE,
23 TE PUNA ROAD, TAURANGA**



 providing
outstanding
ecological
services to
sustain
and improve our
environments



**ECOLOGICAL ASSESSMENT OF WATERWAYS
WITHIN TE PUNA SPRINGS ESTATE,
23 TE PUNA ROAD, TAURANGA**

Contract Report No. 6278

May 2022

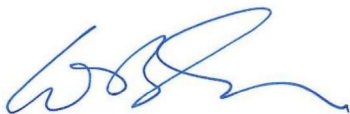
Project Team:

Lucian Funnell - Stream habitat assessment, report author
Fiona Wilcox - Wetland and vegetation assessment, report author
William Shaw - Report author

Prepared for:

Te Puna Springs Estate Limited
PO Box 16349
Tauranga 3147

Reviewed and approved for release by:



W.B. Shaw
Director/Lead Principal Ecologist
Wildland Consultants Ltd

CONTENTS

1.	INTRODUCTION	1
2.	BACKGROUND INFORMATION	1
	2.1 Ecological context	1
	2.2 Catchment character	2
	2.3 Existing freshwater fauna records	2
3.	METHODS	2
	3.1 Overview	2
	3.2 Stream habitat assessment	3
	3.3 eDNA sampling	3
4.	VEGETATION AND HABITAT TYPES	3
	4.1 Terrestrial and wetland vegetation and habitat	3
	4.2 Freshwater	10
	4.2.1 Instream character and habitat	10
	4.2.2 Southern reaches above the pond	11
	4.2.3 Northern reach below the pond	12
5.	FLORA	12
6.	FAUNA	12
	6.1 Freshwater	12
	6.2 Avifauna	13
	6.3 Introduced pest mammals	14
7.	ECOLOGICAL VALUES	14
	7.1 Riparian margin habitat	14
	7.2 Wetland habitat	14
	7.3 In-stream habitat	15
8.	OPTIONS FOR MITIGATION, RESTORATION, AND ENHANCEMENT	15
9.	CONCLUSION	18
	ACKNOWLEDGMENTS	18
	REFERENCES	18
	APPENDICES	
1.	Vascular plant species recorded at the site in March 2022	20
2.	Te Puna Springs Structure Plan layout Revision L, April 2022	23

© Wildland Consultants Ltd 2022

This report has been produced by Wildland Consultants Ltd for Te Puna Springs Estate Ltd. All copyright in this report is the property of Wildland Consultants Ltd and any unauthorised publication, reproduction, or adaptation of this report is a breach of that copyright.

1. INTRODUCTION

A private plan change request by Te Puna Springs Estate Limited (“Te Puna Springs”) has been submitted to rezone land at 23 Te Puna Road, Tauranga. The request seeks to have approximately 5.93 hectares of land on the western side of Te Puna Road rezoned from the current partial Rural and partial Commercial zoning, to a new scheduled site provision within the Commercial Zone as set out in the plan change application (Aurecon 2021).

The proposed development would require removal of an existing stormwater pond, infilling of the southern stream reaches on the property, and creation of an off-line pond/wetland area (Aurecon 2021). The new pond/wetland would include extended detention ponds and a larger, main pond from which the settled stormwater would discharge back into the lower (northern) stream reach. The plan change provides an opportunity to enhance the ecological values of the existing stream. Development of options for appropriate ecological enhancement measures requires an understanding of the current values of watercourses on the subject property. This report therefore provides descriptions and an ecological assessment of the current in-stream and riparian margins of the existing watercourses.

2. BACKGROUND INFORMATION

2.1 Ecological context

The property is located in the coastal bioclimatic zone of the Tauranga Ecological District. The Tauranga Ecological District (c. 85,670 hectares) is situated in the Western Bay of Plenty, between the eastern foothills of the Kaimai-Mamaku Range and the Pacific Ocean, and includes the western extent of the coastal dunes system that extends between Waihī Beach and Ōpōtiki. The Ecological District lies largely within the coastal and semi-coastal bioclimatic zones.

Tall podocarp-broadleaved forest would have historically covered all of the hill country and some of the flat land of the Ecological District, including the dune systems, with the exception of the foredunes and the extensive freshwater wetlands on the plains. Forest vegetation would have been dominated by rimu (*Dacrydium cupressinum*) and tawa (*Beilschmiedia tawa*), with other podocarp species such as miro (*Prumnopitys ferruginea*) and mataī (*Prumnopitys taxifolia*) also common. Kauri (*Agathis australis*) is likely to have been present at the northern end of this Ecological District (Stokes 1980). Pōhutukawa (*Metrosideros excelsa*) forest would have occurred on the headlands and hill slopes near the harbour.

Estuarine systems would have been dominated by mangroves (*Avicennia marina* subsp. *australasica*), sea rush (*Juncus kraussii* var. *australiensis*), and oioi (*Apodasmia similis*), which would have graded into saltmarsh ribbonwood (*Plagianthus divaricatus*) and mānuka (*Leptospermum scoparium*) between saltwater and freshwater systems. Freshwater wetlands would have been dominated by raupō (*Typha orientalis*), sedges, harakeke (*Phormium tenax*), and tī kōuka (*Cordyline australis*), with local patches of swamp forest dominated by kahikatea (*Dacrycarpus dacridioides*) with maire tawake (swamp maire; *Syzygium maire*) and large areas of kiekie (*Freycinetia*

banksii). Large freshwater wetlands existed on the Kaituna-Pongakawa plain, and around the Maketu and Waihi Estuaries. Smaller wetlands would have occurred around the harbour margins and along the margins of the major river valleys such as the Wairoa, Kopurererua, and Waimapu.

Present-day vegetation is dominated by exotic species, primarily those associated with agriculture, horticulture, and exotic plantation forest which together cover *c.*77% of Tauranga Ecological District. Indigenous vegetation has been significantly reduced in extent, with indigenous forest, scrub, and shrubland covering *c.*6% of the District and estuarine and wetland habitat covering *c.*3% the District (Landcare Research 2015).

2.2 Catchment character

The wider catchment comprises a mixture of horticultural, pastoral, and lifestyle properties with small areas of mixed indigenous and exotic species forest, scrub, and shrubland. Immediately surrounding the subject property, the land use is predominantly industrial and horticultural and is located in close proximity to a main highway which defines the southern boundary of the property.

2.3 Existing freshwater fauna records

Waterways within the property comprise tributaries of the Oturu Creek, which discharges into Tauranga harbour *c.*2.5 kilometres north of the site. A range of indigenous fish species have been recorded in Oturu Creek, with seven species recorded from the lower reach of Oturu Creek close to Tauranga Harbour, and three species found from higher in the Oturu Creek catchment (Table 1). The upper catchment records are from a stream reach located close to the subject property, and these records are likely to be representative of the species present in the waterways at the site.

Table 1: Fish species recorded in the upper and lower Oturu Creek catchment; data from NZFFD.

Species	Common Name	Lower Catchment	Upper Catchment
<i>Anguilla australis</i>	Shortfin eel	Y	Y
<i>Anguilla dieffenbachii</i>	Longfin eel	Y	Y
<i>Galaxias maculatus</i>	Inanga	Y	Y
<i>Gobiomorphus huttoni</i>	Redfin bully	Y	-
<i>Gobiomorphus cotidianus</i>	Common bully	Y	-
<i>Gambusia affinis</i>	Gambusia	Y	-
<i>Retropinna retropinna</i>	Common Smelt	Y	-

3. METHODS

3.1 Overview

A site visit was undertaken on 3 March 2022 during fine still weather. Vegetation and habitat types along the riparian margins of the waterways within the property were mapped and described, and a list of vascular plant species observed was compiled. Representative site photographs were taken and incidental observations of fauna were recorded. Two methods for quantifying the ecological and habitat values of the

waterways within the site were used: 1) a rapid stream habitat assessment, and 2) water sampling for eDNA analysis. Further details on these two assessments are provided below.

3.2 Stream habitat assessment

A brief site walkover was undertaken to visually assess the uniformity of the waterways within the site and to determine the number of stream habitat assessments required. Two reaches of the stream were chosen for assessment using the rapid site characterisation Protocol 1 (Harding *et al.* 2009): one along the upper main stream channel which has been heavily modified and which has little riparian cover, and the other in the lower reach of the stream which appears to be relatively unmodified and has good riparian cover.

3.3 eDNA sampling

Sampling of freshwater habitats was undertaken at six locations between 1030 to 1300, during fine weather. Three samples were collected from the stream below the pond, one sample just below the existing pond, and two samples from above the pond (Figure 1). At each location, one eDNA sample was taken using the method outlined by Wilderlabs. This consisted of collecting water with a syringe and pushing that water through a filter. Multiple water samples were taken at each point either until the filter became clogged or until 1,000 millilitres of water had been passed through the filter. Samples were sent off to be analysed for fish, insect, bird, and mammal DNA using a DNA metabarcoding method (Wilkinson 2020).

The analysis supplies DNA sequence counts for each sample which can then be used to loosely predict the abundance/biomass of organisms in the environment sampled. Good prediction of abundance and biomass requires combining results over multiple replicate samples, however a single sampling period gives an indication of species that are present within or alongside the stream. Several factors can influence eDNA sequence counts, including the distance of organisms from the sampling point, the presence of dead/decaying organisms, and assay biases (Wilkinson 2020).

4. VEGETATION AND HABITAT TYPES

4.1 Terrestrial and wetland vegetation and habitat

Fourteen vegetation and habitat types were identified along the riparian margins of water courses within the site.

- Tree privet forest and scrub.
- Blackberry-climbing dock vineland.
- Exotic grassland and herbfield.
- Raupō-*Carex geminata*-(swamp millet) reedland and sedgeland.
- Lombardy poplar-tree privet-(pine)-(black wattle) treeland and scrub.
- Tutunawai-Mercer grass-(swamp millet) grassland and herbfield.
- Grey willow-(she oak) forest and treeland.
- (Queensland poplar)/mixed exotic species grassland and herbfield.

- Blackberry vineland.
- Patchy exotic grassland.
- Open water.
- Mixed exotic species herbfield.
- Main stream channel.
- Southwestern tributary.
- Southern tributary.

These predominantly comprise exotic-dominant habitats, however small areas of indigenous dominated habitat area also present. The 14 types are mapped in Figure 1 and described below.

1. Tree privet forest and scrub (c.0.18 hectares)

Tree privet forms a dense canopy up to eight metres tall on the margins of the stream in the northern half of the site. The understorey and groundcover is depauperate with only occasional small patches of *Diplazium australe* within bare ground. Occasional Lombardy poplar (*Populus nigra* 'Italica') and flowering cherry (*Prunus* species) are also present in the canopy.



Plate 1: Main northern stream channel near the northern property boundary. The main cover is tree privet stems and vegetation diversity is lacking. 2 March 2022.

2. Blackberry-climbing dock vineland (c.0.11 hectares)

Upper riparian margins on the eastern side of the lower stream reach support vineland dominated by blackberry (*Rubus fruticosus*) and climbing dock (*Rumex sagittatus*) with occasional emergent gorse (*Ulex europaeus*), flowering cherry, and black wattle (*Acacia mearnsii*). These areas also have a narrow strip of exotic grassland and herbfield at the top of the slope.



3. Exotic grassland and herbfield (c.0.06 hectares)

A small area of grassland and herbfield dominated by exotic species on flat, compacted ground beside and within an ephemeral flow path. Species present include broadleaved fleabane, wild carrot (*Daucus carota*), paspalum (*Paspalum dilatatum*), Mercer grass (*Paspalum distichum*), summer grass (*Digitaria sanguinalis*), sweet vernal (*Anthoxanthum odoratum*), narrow leaved plantain (*Plantago lanceolata*), and creeping buttercup (*Ranunculus repens*).



Plate 2: Blackberry and climbing dock vineland on the upper eastern riparian margins in the northern half of the site. 2 March 2022.



Plate 3: A small ephemeral flow path surrounded by mixed exotic grassland and herbfield. 2 March 2022.

4. Raupō-*Carex geminata*-(swamp millet) reedland and sedgeland
(c.0.05 hectares)

A small area of wetland habitat is present on the northeastern side of the pond in the centre of the main watercourse. Raupō (*Typha orientalis*) reedland with lesser proportions of *Carex geminata* and swamp millet (*Isachne globosa*) dominates the eastern half of this area, with *Carex geminata* becoming more dominant towards the open water habitat. *Diplazium australe* is locally common amongst the *Carex* dominated area, and occasional small blackberry canes and Japanese honeysuckle (*Lonicera japonica*) vines are also present towards the drier margins of this type.



Plate 4: A small area of indigenous wetland habitat dominated by raupō and *Carex geminata* is present beside the existing pond. 2 March 2022.

5. Lombardy poplar-tree privet-(pine)-(black wattle) treeland and scrub
(c.0.05 hectares)

A small area of exotic species treeland and scrub on steep slopes north of the pond. Occasional *Diplazium australe* are present.

6. Tutunawai-Mercer grass-(swamp millet) grassland and herbfield
(c.0.01 hectares)

Dense tutunawai (*Persicaria decipiens*) herbfield is present closest to the pond margins and in areas with a higher water table. Mercer grass grassland is present in slightly drier areas within this type. Small patches of swamp millet are also present.

7. Grey willow-(she oak) forest and treeland (c.0.02 hectares)

A small area of grey willow (*Salix cinerea*) forest and treeland on moderate slopes north of the wetland area. Grey willow forms a dense canopy in most of the area, however the eastern part of this type comprises scattered small she oak (*Casuarina* sp.) trees over exotic grassland and herbfield. Occasional indigenous and exotic species are present beneath the grey willow canopy including *Diplazium australe*, mamaku (*Cyathea medullaris*), and veldt grass (*Ehrharta erecta*).

8. (Queensland poplar)/mixed exotic species grassland and herbfield (c.0.02 hectares)

Queensland poplar (*Homalanthus populifolius*) is regenerating prolifically within mixed exotic species grassland and herbfield on gentle slopes which have been cleared of woody vegetation on the western side of the pond. Grass and herb species present include wild carrot, beggar's tick (*Bidens frondosa*), white clover (*Trifolium repens*), oxeye daisy (*Leucanthemum vulgare*), narrow leaved plantain, summer grass, and veldt grass. Occasional gorse seedlings are also present.

9. Blackberry vineland (c.0.01 hectares)

A small area of blackberry vineland on a raised mound.

10. Patchy exotic grassland (c.0.02 hectares)

A small, narrow area of compacted fill which supports a patchy distribution of an unidentified exotic grass and scattered gorse and tree privet seedlings.



Plate 5: Compacted fill on the western side of the pond. A range of exotic species is regenerating, including grasses, gorse, and tree privet. 2 March 2022.

11. Open water (c.0.02 hectares)

A small shallow area of open water which receives flows from the southern water courses. Sharp-fruited rush (*Juncus acuminatus*) and water purslane (*Ludwigia palustris*) are present on the margins.

12. Mixed exotic species herbfield (<0.01 hectares)

A small floodplain on the western side of the stream supports herbfield dominated by exotic species, including beggar's tick, water pepper (*Persicaria hydropiper*), creeping buttercup, and black nightshade (*Solanum nigrum*), and occasional woolly nightshade (*Solanum mauritianum*) seedlings. *Diplazium australe*, climbing dock, montbretia (*Crocasmia ×crocosmiiflora*), and *Carex geminata* are also present.

13. Main stream channel

A narrow strip of unmown vegetation is present alongside the main stream channel. The stream banks support either exotic herbfield dominated by broadleaved fleabane, or supports patches of tutunawai and soft rush with creeping buttercup also common. Sharp-fruited rush is locally common.



Plate 6: The main stream channel south of the pond supports a narrow strip of riparian vegetation dominated by soft rush and tutunawai. 2 March 2022.

14. Southwestern tributary

The banks of this small, narrow stream channel support a diverse range of regenerating exotic herbs as well as scattered regenerating woody species, and small, local patches of kiokio (*Blechnum novae-zelandiae*) and *Diplazium australe*.

Species noted within this area include broadleaved fleabane, Australian fireweed (*Senecio bipinnatisectus*), lotus (*Lotus pedunculatus*), creeping buttercup, starwort (*Callitriche stagnalis*), blackberry, Queensland poplar, tree privet, water pepper, tutunawai, soft rush, sharp-fruited rush, water purslane, Yorkshire fog (*Holcus lanatus*), greater bindweed (*Calystegia silvatica*), and glossy karamū (*Coprosma lucida*).



Plate 7: The southwestern tributary is small and very narrow and supports a variable width riparian margin containing a wide range of mostly exotic species. 2 March 2022.

15. Southern tributary

The banks of this small, narrow stream channel also contain a mixture of indigenous and exotic species include broadleaved fleabane and tutunawai however dryland species are more common in this reach.

4.2 Freshwater

4.2.1 Instream character and habitat

When the stream was sampled the stream flow was low as there had been low rainfall over recent months. The stream can be categorised as soft-bottomed, with the stream bed substrate predominantly comprising sand and silt with some small gravel patches and patches of willow roots.

Two main riparian habitat types were observed along the watercourses within the site, and are separated by a shallow pond that flows into the lower stream reach through a culvert.

4.2.2 Southern reaches above the pond

Upper reaches of the stream are located south of, and feed into, the existing pond. Water from the pond flows into the lower (northern) stream channel via a culvert under a compacted earth crossing. The upper (southern) stream reaches are fed from three different sources. The main water source appears to be a spring located near the eastern boundary of the property which is permanently flowing (Site Manager, pers. comm.). The other two streams are part of stream systems that flow from the southern side of State Highway 2 and which pass, via culverts below the road, into the southern end of the property. These two small feeder streams flow into the main stream a little above the pond before flowing down through a sediment trap then into the pond. A small area of pooling has formed upstream of the sediment trap as the water velocity has been retarded in this area due to the trap (Plate 8). The sediment trap was installed at this location c.18 months ago, prior to earthworks and vegetation clearance around the waterways (Site Manager, pers. comm.).



Plate 8: Sediment trap just above the pond which has enabled a small pool of water to bank up behind it. 2 March 2022.

The main stream channel, in the southern half of the site, is relatively uniform and narrow (c.0.3-0.8 metres), and appears to have been partially channelised over time. The stream bed substrate is soft and comprises silt and sand with little gravel and no coarser substrate types such as cobbles or boulders. The stream is predominantly straight with homogeneous slow run most of the way and only a few riffles. Stream margins support a narrow strip of unmown vegetation dominated by tutunawai, broadleaved fleabane (*Erigeron sumatrensis*), and soft rush (*Juncus effusus*).

Riparian vegetation provides some instream habitat and shade but most of the water column is unshaded, which has allowed instream periphyton to become common. The

stream banks are relatively stable in most areas, but there are small patches of bare soil where bank erosion has occurred.

4.2.3 Northern reach below the pond

The lower end of the stream, below the culvert, passes through dense forest and scrub cover dominated by tree privet (*Ligustrum lucidum*). The dense riparian cover provides good shade to the water column and important inputs of wood and leaves. The mature root systems of the trees provide important bank stability, preventing bank erosion and protecting the natural instream habitat. The stream is weakly sinuous, and mainly comprises lengths of slow runs, with some pools and occasional riffles, and some undercut banks. The stream bed substrate is soft and comprises even proportions of fine silt and sand with local patches of gravel. Occasional cobbles (≤ 300 millimetres) are present, and in-stream woody debris generally comprises small sticks. No large woody debris was noted. The stream character is fairly typical of lowland stream character located in close proximity to the coast.

5. FLORA

Sixty-seven vascular plant species - including 14 indigenous species and 53 adventive and naturalised species - were recorded from the riparian margin habitats inspected during the site visit. None of the species recorded are classified as Threatened, At Risk (as per de Lange *et al.* 2018), or regionally uncommon.

6. FAUNA

6.1 Freshwater

While undertaking the freshwater surveys, two mature eels (*Anguilla* sp.) were observed. One sighting was in the northern stream reach at habitat assessment Site 1 and the other was near eDNA sample Site 5 (see Figure 1).

Watercourses on the property consist of a pond and stream environments that provide some habitat for indigenous freshwater fish. At the time of sampling in March 2022, the stream environment was slow-flowing with many shallow pools and a predominantly soft muddy substrate. Good shade is provided by the tree privet canopy in the northern stream reach, which is important for maintaining water temperatures suitable for fish. The northern reach also has a more diverse range of instream habitat types, with pools and undercut banks providing refuges for fish. The southern stream reaches are not as well shaded and have less instream habitat diversity, and are therefore not preferable for many fish species, however they may still provide important habitat linking to upper reaches of the streams south of State Highway 2.

The slow homogeneous flows and soft bottom of the southern reaches means that these areas are likely to have relatively low macroinvertebrate community diversity (Harding *et al.* 2009). The more heterogeneous flows and variable instream habitats within the northern reach, and the good vegetation inputs from the surrounding vegetation creates habitat capable of supporting a more diverse macroinvertebrate community. However,

the invertebrate (MCI¹ and EPT²) communities are nevertheless likely to be constrained by the absence of a stony, hard bottom with fast-flowing water.

To determine which fish species are currently utilising the watercourses on the property, environmental DNA (eDNA) samples were collected from the pond and various locations along the stream. Table 2 contains the raw sequence count data for fish DNA detected to species level at each of the sample sites. An interpretation of the data is also presented below.

Table 2: DNA sequence counts of freshwater fauna groups detected across six samples in the waterways located at 23 Te Puna Road, March 2022.

Group Level	Scientific Name	Common Name	Northern Stream reach			Pond	Southern Stream reach	
			Sample Site 1	Sample Site 2	Sample Site 3	Sample Site 4	Sample Site 5	Sample Site 6
Species	<i>Anguilla australis</i>	Shortfin eel	336	802	1464	440	2015	297
Species	<i>Anguilla dieffenbachii</i>	Longfin eel	838	0	24	330	0	0
Species	<i>Galaxias fasciatus</i>	Banded kōkopu	147	161	0	0	290	1082
Species	<i>Gambusia affinis</i>	Mosquitofish	80	0	0	0	0	0

Based on the eDNA data, it is reasonable to assume that shortfin eels, longfin eels, and banded kōkopu utilise the entire stream system at 23 Te Puna Road. Shortfin eels and banded kōkopu generally reside in lowland, slow-moving streams, and longfin eels are often locally common when there is sufficient instream cover (McQueen and Morris 2013). All three indigenous species are good climbers and will be able to travel through the short culvert that currently divides the two reaches.

Mosquitofish were only detected in one sample, within the northern stream reach. It is surprising that they were not detected further up the stream system as they can very quickly colonise an area, particularly in ponds and slow-moving streams with instream vegetation (McQueen and Morris 2013). The lack of instream vegetation in the northern reach may be a factor preventing mosquitofish from becoming common, and the culvert will prevent mosquitofish from dispersing into the pond and the southern reaches, as they lack the ability to climb.

6.2 Avifauna

Five indigenous bird species, which are common in forest, shrubland, and rural-residential habitats, were seen and/or heard during the survey:

- Kōtare (New Zealand kingfisher; *Todiramphus sanctus vagans*).
- Pīwakawaka (fantail; *Rhipidura fuliginosa*).
- Pūkeko (*Porphyrio melanotus melanotus*).

¹ Macroinvertebrate Community Index

² Ephemeroptera, Plecoptera, and Trichoptera orders of insects. Many species within these three groups are sensitive to changes in water quality. Therefore, in general, the more EPT taxa in a waterway, the better the water quality.

- Riroriro (grey warbler; *Gerygone igata*).
- Tūī (*Prosthemadera novaeseelandiae novaeseelandiae*).

Two exotic bird species - common pheasant (*Phasianus colchicus*) and Eurasian blackbird (*Turdus merula merula*) - were also noted during the survey. None of the indigenous bird species noted are classified as ‘Threatened’ or ‘At Risk’ by Robertson *et al.* (2017).

The eDNA data detected one additional indigenous bird species (silveryeye, tauhou; *Zosterops lateralis lateralis*) and two of the five indigenous bird species recorded on-site (pūkeko and kōtare/NZ kingfisher) as well as four additional exotic bird species: mallard (*Anas platyrhynchos*), song thrush (*Turdus philomelos clarkei*), house sparrow (*Passer domesticus*), and myna (*Acridotheres tristis*).

6.3 Introduced pest mammals

The eDNA data detected the following animal species:

- Norway rat (*Rattus norvegicus*)
- House mouse (*Mus musculus*)
- Black rat (ship rat; *Rattus rattus*)
- Ferret (*Mustela furo*)
- Pig (*Sus scrofa*)

In addition to the above pest animal species, possums (*Trichosurus vulpecula*), and hedgehogs (*Erinaceus europaeus*) are likely to be present, and other mustelids (stoats; *Mustela erminea* and weasels; *M. nivalis vulgaris*), and feral and domestic cats (*Felis catus*) may also use the site occasionally.

7. ECOLOGICAL VALUES

7.1 Riparian margin habitat

Although most of the riparian margin vegetation throughout the property is dominated by exotic species, the vegetation - particularly along the northern stream reach - does provide some habitat value for common indigenous and exotic bird species, good shading to the stream, and a source of external food sources for instream biota. The riparian margin habitat will also help to maintain good water quality parameters within the stream. It is therefore of moderate ecological value.

Riparian margin habitat in the southern half of the site has lower habitat value, for both terrestrial fauna and aquatic fauna, but does provide some stream protection. It is of relatively low ecological value.

7.2 Wetland habitat

The small area of indigenous-dominated wetland habitat located on the northeastern margin of the pond is representative of a common wetland habitat beside an area of open water area in Tauranga Ecological District and contains the expected plant species

and diversity. It is likely to provide occasional habitat for pūkeko. Although freshwater wetlands have been greatly reduced in extent within Tauranga Ecological District (Wildland Consultants 2008), the wetland habitat around the pond appears to have developed following construction of the pond c.13 years ago. Therefore, although the wetland habitat is of relatively high ecological value, it does not constitute natural wetland habitat.

7.3 In-stream habitat

The southern stream reaches have the homogeneous characteristics of a modified, straight, slow-flowing stream which provides little instream habitat variation for both macroinvertebrates and fish. In spite of this, eDNA data indicates that indigenous fish species do utilise these reaches. The southern stream reaches are therefore of moderate ecological value.

The northern stream has a more diverse range of instream habitat types, a more abundant source of organic debris, and good stream shading, all of which provide fish refuges and are likely to support a more diverse fish and macroinvertebrate community. This is supported by the eDNA data which indicates that three indigenous fish species utilise the northern stream reach. The northern stream reach is therefore of moderate ecological value.

8. OPTIONS FOR MITIGATION, RESTORATION, AND ENHANCEMENT

It is proposed that all watercourses on the property will be retained in their current location with only the middle reaches being partially modified to enable construction of the retention and extended detention ponds (see Figure 2 and Appendix 2). A buffer zone will also be retained on both sides of each tributary in the southern half of the site, and along the eastern margin of the northern stream reach¹. The buffer zone will be planted with appropriate indigenous species.

Any new culverts which are required for the pond configuration should be low gradient and sufficiently large to enable ongoing low velocity water flows, which will allow fish passage. All of the existing wetland vegetation will be removed by the creation of the proposed retention ponds (see Figure 2). Any fish present within the construction area should be captured and moved prior to removal of the existing pond. A fish management plan should be prepared as part of the regional council consent process, prior to the fish salvage works being undertaken.

Although lowland wetlands are rare in Tauranga Ecological District, it is proposed that the margins of the stormwater ponds, once constructed, will be planted with appropriate indigenous wetland species to help with stormwater treatment and for amenity purposes. The new pond system will be permanently wet. As the existing wetland habitat on the site has developed since construction of the pond, this wetland habitat does not represent a significant constraint to development of the site.

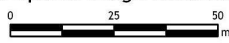
¹ The mapped buffer extent may over-estimate the buffer width because it does not take account of slope or contour; this buffer width should therefore be read as indicative only. Mapped stream locations are also approximate and will be confirmed on the ground prior to construction.



Data Acknowledgment
 Maps contain data sourced from LINZ
 Crown Copyright Reserved

Report: 6278
 Client: Te Puna Springs Estate
 Ref: 03 0006
 Path: E:\GIS\TePunaSprings\A\udc
 File: A278_Figure2_ProposedV1.mxd

Figure 2. Proposed commercial development layout relative to current stream and wetland locations and proposed riparian margin enhancement at Te Puna Springs Estate.



Wildlands
 www.wildlands.co.nz | 0800 101012

Scale: 1:1,100
 Date: 6/05/2022
 Cartographer: KM
 Format: A3

Table 3: Summary of constraints to development and comments on options for mitigation.

Habitat Type	Ecological Value	Level of Constraint	Comments
Wetland habitat	High	Low	<ul style="list-style-type: none"> • Capture and relocate fish prior to existing pond being removed. • Establish a permanently wet pond system, with planted wetland and terrestrial margins. • Ensure ecological input into species selection for planting around the pond margins so that similar habitat values are re-created.
Northern Stream	Moderate	High	<ul style="list-style-type: none"> • The northern stream reach should not be piped. • Avoid clearance and infilling within 10 metres of the stream. • Ensure that the pond outflow discharges into this stream at a continuous rate to maintain a base flow.
Southern Streams	Low/ Moderate	Moderate/ Low	<ul style="list-style-type: none"> • Retain a minimum riparian margin of 5 metres on each side.

As part of the plan change, a stream enhancement plan should be prepared and implemented. Enhancement of the riparian margins of the northern stream reach should focus primarily on reducing the dominance of exotic species and increasing indigenous plant species diversity. Given the high degree of naturalness of the instream character, instream habitat remediation is not considered to be necessary in this instance.

Restoration and enhancement of the northern riparian margins should be undertaken in stages to ensure that blanket removal of the existing stream cover is not undertaken. Blanket vegetation removal would result in significant erosion as the soil on the slopes is very friable. Restoration and enhancement of the southern stream reaches would mainly comprise planting the riparian margins with appropriate indigenous species. Consideration could also be given to some instream enhancement measures to improve instream conditions for freshwater fauna.

A summary of the suggested restoration steps is given below, with full details on restoration and implementation provided in a separate report:

- Separate the riparian margin habitat into three zones:
 - Stream flats which are periodically inundated by flooding;
 - Lower stream margins (2-5 metres width);
 - Upper stream margins.
- Undertake pest plant control. Poison tree privet *in situ* rather than felling, to ensure that stream bank stability is retained.
- Prepare site for planting.
- Plant appropriate, eco-sourced indigenous species.
- Undertake maintenance of plantings for 3-5 years.
- Consideration could also be given to setting up a pest animal control network within the riparian margin habitat to improve breeding and nesting success of avifauna (and potentially enhance lizard habitat, if they are present).

If the existing wetland habitat is retained, a planted indigenous species buffer around the wetland margin would be beneficial. If the existing wetland habitat is not retained, consideration should be given to vegetating the larger stormwater pond with vegetation similar to that which is removed from the existing pond. The new pond should be a permanently wet system.

9. CONCLUSION

Watercourses in the southern part of the property have been heavily modified over many years and have relatively low ecological value. Although degraded, they are still nevertheless used by indigenous fish. They may also provide linking habitat for indigenous freshwater fauna present in the upper reaches south of State Highway 2. Any culverts that are installed as part of the pond construction should be large and of low gradient, to support continued fish passage.

The northern stream reach retains a high degree of naturalness and provides good habitat for indigenous freshwater fauna. Development of this area should be avoided as much as it is practicable to do so. Restoration of the stream margins should be undertaken, to improve indigenous biodiversity values. The width of the northern riparian margin zone for restoration should be 10 metres minimum.

The proposal will retain and enhance the freshwater values within watercourses on the property and will increase indigenous biodiversity values of the site.

ACKNOWLEDGMENTS

Annaliese Michel provided site access. Graham (Site Manager) provided useful information on the history of the property, and flow levels within the waterways, and timings of various earthworks and sediment control structures within the property.

REFERENCES

- Aurecon 2021: Te Puna Springs Proposed Private Plan Change, 23 Te Puna Road, Tauranga. *Aurecon New Zealand Report Reference No. 251282*. Prepared for Te Puna Springs Estate Limited, 333 pp.
- de Lange P.J., Rolfe J.R., Barkla J.W., Courtney S.P., Champion P.D., Perrie L.R., Beadel S.M., Ford K.A., Breitwieser I., Schönberger I., Hindmarsh-Walls R., Heenan P.B., and Ladley K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Department of Conservation, Wellington. 82 pp.
- Dunn N.R., Allibone R.M., Closs G.P., Crow S.K., David B.O., Goodman J.M., Griffiths M., Jack D.C., Ling N., Waters J.M., and Rolfe J.R. 2018: Conservation status of New Zealand freshwater fishes, 2017. *New Zealand Threat Classification Series 24*. Department of Conservation, Wellington. 11 pp.

Harding J., Clapcott J., Quinn J., Hayes J., Joy M., Storey R., Greig H., Hay J., James T., Beech M., Ozane R., Meredith A., and Boothroyd I. 2009: Stream habitat assessment protocols for wadeable rivers and streams of New Zealand. School of Biological Sciences. University of Canterbury. 136 pp.

McQueen S. and Morris R. 2013: A Photographic Guide to Freshwater Fishes of New Zealand. New Holland.

Robertson H.A., Dowding J.E., Elliot G.P., Hitchmough R.A., Miskelly C.M., O'Donnell C.F.J. Powlesland R.G., Sagar P.M., Scofield R.P., and Taylor G.A. 2013: Conservation status of New Zealand birds. *New Zealand Threat Classification Series 4*. Department of Conservation, Wellington. 22 pp.

Wilkinson S. 2020: eDNA assay guide. Wilderlab NZ Ltd.

VASCULAR PLANT SPECIES RECORDED
AT THE SITE IN MARCH 2022

INDIGENOUS SPECIES

Dicot. trees and shrubs

<i>Coprosma lucida</i>	karamū, kāramuramu, glossy karamū
<i>Knightia excelsa</i>	rewarewa
<i>Piper excelsum</i> subsp. <i>excelsum</i>	kawakawa

Ferns

<i>Blechnum novae-zelandiae</i>	kiokio
<i>Cyathea dealbata</i>	ponga, silver fern
<i>Cyathea medullaris</i>	mamaku
<i>Diplazium australe</i>	
<i>Pteris macilenta</i>	titipo, sweet fern
<i>Pyrrosia elaeagnifolia</i>	leather-leaf fern

Grasses

<i>Isachne globosa</i>	swamp millet
------------------------	--------------

Sedges

<i>Carex geminata</i> agg.	rautahi
----------------------------	---------

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Typha orientalis</i>	raupō
-------------------------	-------

Dicot. herbs (other than composites)

<i>Persicaria decipiens</i>	tutunawai
<i>Viola cunninghamii</i>	

NATURALISED AND EXOTIC SPECIES

Gymnosperms

Pinus sp. pine

Monocot. trees and shrubs

Alocasia brisbanensis elephant's ears

Dicot. trees and shrubs

Acacia mearnsii black wattle
Alnus glutinosa common alder
Berberis glaucocarpa barberry
Casuarina sp. sheoak
Crataegus monogyna hawthorn
Cytisus scoparius broom
Datura stramonium thorn apple
Eucalyptus sp. eucalyptus
Homalanthus populifolius Queensland poplar
Ligustrum lucidum tree privet
Persea americana avocado
Populus nigra 'Italica' Lombardy poplar
Prunus sp. ornamental cherry
Rubus sp. (*R. fruticosus* agg.) blackberry
Salix cinerea grey willow
Salix ×*fragilis* crack willow
Solanum mauritianum woolly nightshade
Ulex europaeus gorse

Dicot. lianes

Calystegia silvatica greater bindweed
Hedera helix ivy
Lonicera japonica Japanese honeysuckle
Rumex sagittatus climbing dock

Grasses

Cortaderia selloana pampas
Digitaria sanguinalis summer grass
Ehrharta erecta veldt grass
Holcus lanatus Yorkshire fog
Paspalum dilatatum paspalum
Paspalum distichum Mercer grass

Sedges

Cyperus eragrostis umbrella sedge

Rushes

<i>Juncus acuminatus</i>	sharp-fruited rush
<i>Juncus effusus</i> var. <i>effusus</i>	soft rush, leafless rush

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Crocasmia</i> × <i>crocosmiflora</i>	montbretia
---	------------

Composite herbs

<i>Bidens frondosa</i>	beggars' ticks
<i>Erigeron sumatrensis</i>	broad-leaved fleabane
<i>Leontodon taraxacoides</i>	hawkbit
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Taraxacum officinale</i>	dandelion

Dicot. herbs (other than composites)

<i>Callitriche stagnalis</i>	starwort
<i>Daucus carota</i>	wild carrot
<i>Geranium molle</i>	dovesfoot cranesbill
<i>Lotus pedunculatus</i>	lotus
<i>Ludwigia palustris</i>	water purslane
<i>Modiola caroliniana</i>	creeping mallow
<i>Persicaria hydropiper</i>	water pepper
<i>Phytolacca octandra</i>	inkweed
<i>Portulaca oleracea</i>	wild portulaca
<i>Ranunculus repens</i>	creeping buttercup
<i>Rumex obtusifolius</i>	broad-leaved dock
<i>Solanum nigrum</i>	black nightshade
<i>Trifolium repens</i>	white clover
<i>Verbena bonariensis</i>	purple-top

APPENDIX 2 - TE PUNA SPRINGS STRUCTURE PLAN LAYOUT REVISION L, APRIL 2022



LEGEND

- 1 Commercial
- 2 Commercial
- 3 Hall
- 4 Spring/Puna
- 5 Commercial
- 6 Commercial
- 7 Commercial
- 8 Commercial
- 9 Stormwater management area
- 10 4m wide landscape buffer strip
- 11 2m wide landscape buffer strip
- 12 10m wide riparian restoration strip

KEY

- Specimen trees
- Landscape buffer strip
- Grassed area
- Traffic calming strip
- 30m Setback
- Open channels/streams



This plan has been prepared by Boffa Miskell Limited on behalf of the Client. It is issued for the Client's use in accordance with the terms of the Client's contract for professional services. Any use or reliance by a third party on this plan or any information contained herein is at their own risk and Boffa Miskell Limited, its directors, employees, agents, subcontractors or other external sources, shall not be liable for any loss or damage, including consequential loss or damage, arising from the use or reliance on this plan or any information contained herein. The Client shall be responsible for ensuring that the information provided by the Client is accurate and up-to-date.

North arrow symbol

Scale: 0 to 50m

1:1,500 @ A3

Data Sources: Aurecon Limited

Projection: NZGD2000/N.Z. Transverse Mercator

Legend

Area A (blue outline)

Area B (orange outline)

TE PUNA SPRINGS INDUSTRIAL DEVELOPMENT
 Structure Plan
 Plan prepared for Aurecon by Boffa Miskell Limited
 Date: 21/04/2022 | Revision: L |
 Project Manager: Marne Huges@boffamiskell.co.nz | Drawn: All | Checked: MHU

T18002
 Sheet 1



Call Free 0508 WILDNZ
Ph: +64 7 343 9017
Fax: +64 7 3439018
ecology@wildlands.co.nz

99 Sala Street
PO Box 7137, Te Ngae
Rotorua 3042,
New Zealand

Regional Offices located in
Auckland, Hamilton, Tauranga,
Whakatane, Wellington,
Christchurch and Dunedin

ECOLOGY RESTORATION BIODIVERSITY SUSTAINABILITY

www.wildlands.co.nz



ATTACHMENT C

COPY OF WBOPDC WASTEWATER RESOLUTION

From: aaron@collierconsultants.co.nz
Sent: Wednesday, 18 May 2022 7:06 PM
To: aaron@collierconsultants.co.nz
Subject: FW: CONNECTION OF TE PUNA SPRINGS BUSINESS PARK TO OMOKOROA WASTEWATER TRANSFER PIPELINE

From: Carolyn Irvin <Carolyn.Irvin@westernbay.govt.nz>
Sent: Monday, 16 May 2022 4:06 pm
To: aaron@collierconsultants.co.nz
Cc: Coral-Lee Ertel <Coral-Lee.Ertel@westernbay.govt.nz>
Subject: RE: CONNECTION OF TE PUNA SPRINGS BUSINESS PARK TO OMOKOROA WASTEWATER TRANSFER PIPELINE

Hi Aaron

Please see below resolution passed and carried at the Performance and Monitoring Committee meeting on 5 May 2022, published today:

11.2 Connection of Te Puna Springs Business Park to Ōmokoroa Wastewater Transfer Pipeline

Resolution PM22-3.5

Moved: Deputy Mayor J Scrimgeour

Seconded: Mayor G Webber

1. That the Asset and Capital Manager's report dated 5 May 2022 titled 'Connection of Te Puna Springs Business Park to Ōmokoroa Wastewater Transfer Pipeline' be received.
2. That the report relates to an issue that is considered to be of low significance in terms of Council's Significance and Engagement Policy.
3. That, subject to Plan Change 93 – Te Puna Springs Commercial Zone proceeding, Council **approves** the connection of the Te Puna Springs Commercial Zone into the Ōmokoroa transfer pipeline.
And
4. That Te Puna Springs Business Park be charged a volumetric capital connection charge of \$3,658 per household equivalent, and this be built into the FINCO schedule for the park.

Kind regards
Carolyn