Ecological Impact Assessment Report

Proposed development of Totara Park Agrisphere™

90R Wairere Road, The Gardens

Prepared for The Argisphere Ltd

4 June 2023

Gecko Ecologists LTD

Document Approval

Document title:	Ecological Impact Assessment Report: Proposed development of Totara Park Agrisphere
Prepared For:	The Agrisphere Ltd
Version:	1
Date:	2 June 2023

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Cover illustration: Intersection of the proposed site and the neighbouring forest fragment in Totara Park.

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1. Introduction

This report has been prepared to assess the ecological impacts of the proposed tourist attraction, "The Agrisphere™", to be constructed at 90R Wairere Road, The Gardens.

The development will take place on the southern portion of the property, and involves the construction of a large arena, a carpark, and a smaller grassy 'petting zoo' area. An access road and construction workers' facilities will also require construction (Figure 2). The proposed development will involve the clearing of 1.9ha of pasture land, including 0.3ha trees within the paddock.

This Ecological Impact Assessment assesses the potential effects of this proposed construction on the site's ecological values.

This report includes:

- A description of ecological values of habitats and species at the site
- An assessment of potential effects on these values by the proposed construction
- Recommendations to avoid or mitigate these effects where necessary

*Figure 1 V*iew of the site from the road (Nyssan Place), showing the open pasture and forest patch in the distance.

Figure 2 Map of ecological resources and proposed construction at the site

2. Ecological Site Assessment

2.1 Methods

A desktop data review was conducted using publicly available sources, including Auckland Council documents, Department of Conservation reports, and species lists sourced from iNaturalist.

A field assessment was also performed, involving two visits to the site on 18th April at midday and 19th April in the evening. Any bird, plant and insect species observed in and around the site were opportunistically recorded. Notable habitat features were also identified.

2.2 Site Overview and Ecosystem Types

The proposed construction will occur in Totara Park, a large 216ha section of native remnant forest and farmland that spans across urban Manukau and Manurewa in South Auckland. This park is located in the Manukau ecological district of the Auckland ecological region.

The site itself is a 1.6ha section in the southern part of the park, adjacent to residential housing in Nyssan Place. The site is predominantly composed of farmland pasture, and also contains a patch of bush on its northern edge which is planned for removal.

The southern side of the site borders a native forest. This 45ha fragment is classified as a 'Significant Ecological Area' (SEA) under the Auckland Unitary Plan (Figure 2). This fragment is classified by Auckland Council as a mixture of 'kauri, podocarp, broadleaved beech forest' (WF12) and 'taraire, tawa, podocarp forest' (WF9) (see Appendix B Figure 9). As a remnant fragment, it is likely composed of primary growth (Ringer, 2012[1]). As such, WF12 is representative of the original ecosystem type for this area (Appendix B Figure 10). Both ecosystem types are currently considered "endangered" by Auckland Council (Singers et al., 2017[2]).

The site is positioned near Puhinui Stream, a large watercourse which begins in Totara Park and runs through much of South Auckland before discharging into Manukau Harbour. The portion of the stream adjacent to the site is considered a 'Natural Stream Management Area' (NSMA) under the Auckland Council Unitary Plan.

[1] Ringer, B. (2012). *Countryside in the City: A History of Totara Park Manurewa*. Auckland Communities Foundation.

[2] Singers, N. J., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J. W. D., ... & Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council, Te Kaunihera o Tāmaki Makaurau.

2.3 Key Habitats

2.3.1 Pasture

Figure 3 Bare mud from cattle activity in the centre of the site.

The majority of construction will occur on open grassland (Figure 2). This area is currently used as grazing pasture, and is composed almost entirely of exotic grasses, legumes and herbaceous weeds. The dominant species are grasses typical of grazing pasture - rough-stalked meadow grass (*Poa trivialis*), narrow-leaf plantain (*Plantago lanceolata*), Kikuyu grass (*Ranunculus repens*), and red and white clover (*Trifolium pratense and Trifolium repens*). Many common pasture weeds are also present (Appendix A Table 4). A fence runs through the centre of the site, and the ground along this is churned mud due to trampling by cattle (Figure 3).

2.3.2 Mixed Native-Exotic Bush Patch

Figure 4 Mixed native-exotic bush patch adjacent to site. Note the large *eucalyptus* trees.

The proposed construction will involve removing part of a bush patch on the northern border of the site (Figure 2). This patch contains a mixture of exotic and native species - predominantly large exotic eucalyptus (*Eucalyptus*) and pine (*Pinus*) trees, and a variety of large 'Not Threatened' native trees (Appendix A Table 4). Considering the eclectic mix of natives, these

trees were most likely planted. A mature pōhutukawa tree (*Metrosideros excelsa*) was also observed, which is considered 'Threatened – Nationally Vulnerable' in its natural range – however, the individual here is, again, likely planted. Large invasive Chinese privot (*Ligustrum sinense*) were also seen growing near the fence. The bush is clearly mature, with a dense understory and many trees well over 10m tall. Being mature and structurally complex, this bush patch may provide fruit, nectar and shelter for birds, insects and potentially lizards.

2.3.3 Neighbouring Remnant Forest Fragment

Figure 5 Edge of remnant podocarp-broadleaf forest bordering the proposed site. Note the tall, dense tōtara trees which dominate this forest.

The southern edge of the site borders a remnant forest fragment. The area here is entirely covered with a 'Significant Ecological Area' overlay (Appendix B Figure 11). The forest is clearly mature, dominated by large tōtara trees (*Podocarpus totara*) and kanuka (*Kunzea ericoides*) well over 20m tall. Kanuka is nationally considered 'Threatened – Nationally Vulnerable'. Other notable trees near the site include a rimu (*Dacrydium cupressinum*) and rewarewa (*Knightia excelsa*), both at least 25m tall. The forest contains a diverse range of native species expected in this ecosystem type, with a complex structure including an understory and epiphytic plants (Appendix Table 5).

Due to its narrow shape, the fragment has a large amount of forest edge. However, this is dominated by dense shrubs - mahoe (*Melicytus ramiflorus*), lacebark (*Hoheria populnea*), and hangehange (*Geniostoma ligustrifolium*) – which may help buffer light penetration into the forest interior (Harper et al., 2005[3])

The vegetation at this site are fairly representative of the Auckland council classification for this forest 'kauri, podocarp, broadleaved, beech forest' (WF12). While there is a lack of kauri and beech trees at this site, which is expected based on the topography of this area - shallow slopes and moist gulleys tend to be podocarp-dominated in this ecosystem type (Singers, 2017[4]).

[3] Harper, K. A., Macdonald, S. E., Burton, P. J., Chen, J., Brosofske, K. D., Saunders, S. C., ... & Esseen, P. A. (2005). Edge influence on forest structure and composition in fragmented landscapes. *Conservation biology*, *19*(3), 768-782.

[4] Singers, N. J., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J. W. D., ... & Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council, Te Kaunihera o Tāmaki Makaurau.

2.4 Fauna

2.4.1 Birds

A wide range of birds were observed at the site, although the majority of these were 'Introduced and Naturalised' species (Appendix A Table 6). Several native birds have also been seen using the pasture, but these are all species common seen on farmland or urban areas (Appendix A Table 6).

Tuī (*Prosthemadera novaeseelandiae novaeseelandiae*) were also heard in the mixed native-exotic bush patch. This bush patch contains fruit-bearing puriri (*Vitex lucens*) and many tall trees, and so likely provides food, nesting and roosting habitat for birds. The mixed native-exotic patch may also act as an 'ecological stepping stone', connecting bird populations from the remnant forest fragment with other forest patches in the surrounding landscape. For instance, kererū (*Hemiphaga novaeseelandiae*) have been seen feeding in a small crop of trees north of the bush patch, and may disperse through the bush patch.

The neighbouring forest fragment is known to host three native 'Not Threatened' forest birds – tuī, kererū (*Hemiphaga novaeseelandiae*) and North Island fantail (*Rhipidura fuliginosa placabilis*). However, the rarer native birds expected in this ecosystem type are absent (Singers et al., 2017[5]). A diverse range of introduced birds also use this forest (Appendix A Table 6).

Figure 6 Flock of Spur-winged plovers (*Vanellus miles novaehollandiae*) seen at the site.

2.4.2 Lizards

The pasture has low habitat complexity, lacking rocks, shrubs, or fallen logs. However, the long grass may provide sufficient cover and insects for skinks to feed in the pasture if the neighbouring forest patches provide suitable habitat. The lack of shrubs and trees means there are unlikely to be geckos within the pasture.

The mixed native-exotic bush patch contains dense vegetation and mature knolled trees which may provide habitat for skinks and geckos. Fruiting plants may also provide food. Lizard

[5] Singers, N. J., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J. W. D., ... & Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council, Te Kaunihera o Tāmaki Makaurau.

presence is especially likely considering its proximity to the native forest fragment, which may have allowed for dispersal.

Skinks and geckos may be present in the adjacent native forest fragment, as they are commonly seen in its ecosystem type. The forest has a complex understory, with fallen logs, low shrubs and thick leaf litter, all of which provide ideal habitat for skinks. The mature trees also have gnarled hollows which may provide habitat for geckos.

There have been no recorded observations of lizards at the site, however a copper skink (*Oligosoma ornatum*) and an ornate skink (*Oligosoma aeneum*) have both been observed within 3km of the site, suggesting these species may be present if there is suitable habitat. Further lizard monitoring such as pitfall traps can determine lizard presence at this site.

Figure 7 Habitat within the neighbouring remnant forest. Note the thick leaf litter, fallen branches and dense vegetation which may provide habitat for lizards.

2.5 Watercourses

While the site itself does not contain any permanent watercourses, it contains an overland flow path which contributes runoff to the nearby NSMA Puhinui Stream (Figure 2). The area containing this flow path could not be accessed during the field survey, and so future survey work will be required to understand the how frequently the flow paths contain water and to assess the ecological significance of these streams.

During the field assessment, there were two small streams present in the adjacent native forest fragment (Figure 8). These small streams feed into the larger Puhinui Stream, a large fourth-order stream that runs through Totara Park and much of South Auckland before emptying into Manukau Harbour. Many sections of Puhinui Stream have been converted into reserves, and so this watercourse acts as an ecological corridor to assist connectivity between Flat Bush and the Manukau Harbour. Near the site, the stream is in excellent condition. It has high structural complexity with diverse riparian vegetation and a natural streambed.

Figure 8 Temporary water courses observed in the bush section neighbouring the site.

2.5.1 Freshwater Fauna

The small streams are temporary and so are unlikely to host any freshwater species.

Considering that the neighbouring Puhinui Stream is in excellent condition and has high structural complexity, it likely hosts a large range of native freshwater fauna. A further field survey will be required to determine the full biodiversity of the stream. Public databases record six aquatic native invertebrates (Appendix A Table 8), including the 'At Risk – Declining' New Zealand freshwater mussel (*Echyridella menziesii*). Two 'Not Threatened' endemic fish, the common bully (*Gobiomorphus cotidianus*) and short-fin eel (*Anguilla australis)*, have also been observed in Puhinui stream within 1km of the site.

3. Assessment of Site Ecological Values

The following table lays out the ecological values of each habitat type and fauna group within the site, according to Ecological Impact Assessment guidelines (Roper-Lindsay et al., 2018[6]).

Table 1 Breakdown of Site Ecological Values

Ecological Resource	Representativeness	Rarity/ Distinctiveness	Diversity and Pattern	Ecological Context	Overall Value
Pasture habitat	**Negligible** - entirely exotic pasture grasses and weeds. Not representative of expected podocarp-broadleaf forest	**Negligible** - typical grazing pasture, which is common in the surrounding landscape.	**Negligible** - minimal plant diversity, homogenously dominated by five grass species. Regular grazing results in low habitat complexity.	**Low** - may provide habitat and food for certain common native birds. Provides poor dispersal for lizards and forest birds.	**Negligible**
Mixed native-exotic bush habitat	**Low** - equal mixture of exotic and native species (likely planted). Composition is not representative of any native forest type.	**Low**- native plants are common, 'Not Threatened' species. Patches of dense vegetation such as this are uncommon in the surrounding farm landscape.	**Low** - moderate diversity of native trees, although none are particularly abundant. High habitat complexity, with a dense understory.	**Moderate** - provides food, shelter and nesting for birds and lizards. Important for connectivity between the native forest fragment and vegetation in the surrounding landscape	**Low**
Neighbouring remnant forest fragment	**High –** composition is representative of original ecosystem type. Features impacted slightly by fragmentation	**High** – ecosystem type is 'endangered' and the entire fragment is under a SEA overlay	**Moderate –** high plant diversity and habitat complexity.	**High –** fragment acts as major species source and sink in the surrounding landscape. Provides habitat for rare fauna.	**High**
Neighbouring Puhinui stream	**Moderate** – stream is in very good condition, with complete riparian vegetation and a fully natural streambed	**Moderate –** this stream is under a 'Natural Stream Management Area' overlay	**High –** stream has a complex structure and provides habitat for a range of species	**High –** stream runs through much of South Auckland, and acts as a natural corridor.	**High**

[6] Roper-Lindsay, J.; Fuller, SA.; Hooson, S.; Sanders, MD.; Ussher, GT. 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Birds	**Low** - predominantly exotic birds commonly seen in pasture, although some common natives are present	**Low** – Only common, 'Not Threatened' bird species were observed on site.	**Low -** bird diversity is high at this site, but again most are exotic	**Low –** important seed dispersers in the surrounding landscape	**Low**
Lizards	**Moderate** – many lizard species are expected for the natural ecosystem type.	**High** – Several 'At Risk – Declining' species may be present onsite	**Low** – distribution of lizards likely to be limited on site	**Moderate –** lizards sensitive to environmental change	**Moderate**
Freshwater fauna	**Moderate –** species composition is expected to be highly representative of a forest freshwater stream	**High** – harbours 'At Risk – Declining' freshwater mussels	**High -** considering its condition and structural complexity, the stream is likely to host a diverse range of species	**High** – freshwater species play an important role for the health of the stream	**High**

4. Assessment of Magnitude of Effects

The proposed project involves building an arena, carpark, outdoor petting zoo, and driveway at the site. It will involve clearing approximately 1.6ha of grazing pasture and 0.3ha of mixed native-exotic vegetation. The following section discusses the predicted magnitude of effects of these activities, according to the Ecological Impact Assessment guidelines (Roper-Lindsay et al., 2018[7]).

4.1 Effects on Site Habitats

4.1.1 Pasture

The proposed construction will involve the permanent 1.6ha loss of pasture habitat. The magnitude of effects on pasture habitat is considered **high,** as there will be a major alteration to key features of the existing habitat.

4.1.2 Mixed native-exotic bush patch

The proposed construction will involve clearing 0.3ha of native-exotic mixed vegetation - about half of the existing habitat. The resulting reduced forest size also will lead to a permanent increase in edge effect. This may be involve increased light and pest intrusion. Activity during construction may also result in a temporary spread of pest species onsite, including the noxious weed Chinese privet (*Ligustrum sinense*) which as a shade-tolerant species can invade the neighbouring forest fragment (Singers et al., 2017[8]). Construction may also result in increased dust, which may temporarily inhibit photosynthesis in the surrounding vegetation.

Overall, the unmitigated magnitude of effects on vegetation and habitat is **high.**

4.2 Effects on Site Fauna

4.2.1 Birds

The proposed clearance of pasture and bush habitat may lead to a temporary risk of death and injury for birds, particularly if conducted during nesting season. Removal will also result in a permanent reduction in food, nesting and roosting habitat for birds. Construction noise and activity may lead to a high temporary impact on bird feeding, breeding and dispersal behaviour. The proposed facilities will also result in elevated noise levels and human activity, which may lead to a moderate permanent decrease in bird visitation.

Overall, the magnitude of effects on birds is considered to be **moderate**.

4.2.2 Lizards

Clearance of pasture and trees poses a risk of injury and death for lizards. There will also be a permanent loss of territory and foraging habitat. As with birds, the construction and the subsequent facilities will result in increased noise and light pollution, which may lead to

[7] Roper-Lindsay, J.; Fuller, SA.; Hooson, S.; Sanders, MD.; Ussher, GT. 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

[8] Singers, N. J., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J. W. D., ... & Webb, C. (2017). *Indigenous terrestrial and wetland ecosystems of Auckland*. Auckland Council, Te Kaunihera o Tāmaki Makaurau.

elevated stress and decreased foraging in lizards. These impacts are likely to be temporarily high during construction**,** and permanently moderate.

Overall, the unmitigated magnitude of effects on fauna at this site are **high**.

4.3 Indirect Effects on Surrounding Landscape

4.3.1 Neighbouring native remnant forest (SEA)

The planned facilities will likely result in permanently increased mammalian pest abundance. Buildings housing animals often attract rodents due to the abundance of feed and bedding. Rodent populations may then enter and cause harm to the neighbouring remnant forest. Permanent pest management will help mitigate this effect. Dust during construction may also settle on native vegetation in this area, impeding photosynthesis. The clearance of the bush patch and the positioning of the area will also result in a major permanent loss of connectivity between the bush patch, the native remnant forest, and the surrounding landscape.

Overall, the temporary and permanent magnitude of effects on the native remnant forest is considered **moderate.**

4.3.2 Watercourses – Neighbouring Puhinui Stream (NSMA)

The site is situated on an overland flow path, and so construction may also lead to temporary sediment and pollutant runoff into the nearby Puhinui Stream. Soil runoff may carry the kauri dieback pathogen (*Phytophthora agathidicida),* which could potentially infect kauri trees in the native remnant forest further downstream. The planned 'petting zoo' area may also lead to permanent increased runoff of cattle excretion, which may also reduce waterway quality.

Therefore, the temporary and permanent magnitude of effects on the neighbouring Puhinui stream will be **moderate**.

5. Level of Effect

The pre-mitigation level of effects on site ecological resources are outlined in Table 2 below. These were determined based on ecological values and magnitude of effects, as discussed in sections 3 and 4 above. Under current guidelines, any 'moderate' or 'high' level of effects are considered 'significant', meaning mitigation measures will be required to reduce this effect (Roper-Lindsay et al., 2018[9]).

Table 2 Summary of pre-mitigation level of effects of each ecological feature on site.

Ecological Resource	Ecological Value	Impact summary	Unmitigated Magnitude of Effect	Level of Effect (*mitigation required)
Pasture habitat	**Negligible**	• **Permanent** loss	**High**	**Very low**
Mixed native-exotic bush habitat	**Low**	• **Permanent** loss • **Temporary** elevated dust	**High**	**Low**
Neighbouring remnant forest fragment	**High**	• **Temporary** elevated dust • **Permanent** increased plant/animal pest invasion risk • **Permanent** loss of landscape connectivity	**Moderate**	**High***
Neighbouring Puhinui stream	**High**	• **Temporary** increased silt pollution • **Permanent** increased agricultural runoff	**Moderate**	**High***
Birds	**Low**	• **Temporary** risk of injury/death • **Temporary** and **permanent** increased noise/light pollution • **Permanent** increased human disturbance	**Moderate**	**Low**
Lizards	**Moderate**	• **Temporary** risk of injury/death • **Temporary** and **permanent** increased noise/light pollution • **Permanent** increased human disturbance	**Moderate**	**Moderate***
Freshwater species	**High**	• **Temporary** reduced water quality	**Low**	**Low**

[9] Roper-Lindsay, J.; Fuller, SA.; Hooson, S.; Sanders, MD.; Ussher, GT. 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

6. Recommendations

Most significant effects outlined above could be avoided through modification of the proposed construction. Strategic placement of construction elements could mean clearance of the bush patch is not required, there is no overlap with the overland flow path, and there is distance from the native forest fragment. Additionally, repositioning the arena closer to the road would mean it does not impede connectivity between the bush patch and the remnant forest.

However, if avoidance is not possible, effects on site resources can be minimised and remedied through the following actions:

- **Sediment management** - Sediment fence to reduce runoff into Puhinui Stream
- **Lizard management** - a population survey can establish the diversity and population size of lizards in the bush patch and pasture. If present, lizards will need to be caught during habitat clearance, and translocated to a suitable nearby location.
- **Replacement planting** - native plantings could extend the northern and eastern edges of the bush patch to reduce impacts on connectivity and habitat loss. Considering the age and structural complexity of the removed habitat, a minimum of 3:1 replacement will be required.

Mitigation for effects on other site resources are not required, but could include:

  - Barrier between the construction site and neighbouring native forest fragment to block dust, noise, and light
  - Seasonal considerations for bush patch removal to reduce impacts on nesting birds
  - Weed control
  - Animal pest control

7. Conclusion

Overall, this ecological impact assessment report found significant ecological effects of the proposed construction of the Agrisphere™. While habitats onsite are generally of low ecological value, the mixed bush patch within the paddock may play an important role for landscape connectivity. Additionally, the construction will have indirect effects on ecologically-significant neighbouring habitats. Therefore, measures to reduce these effects will be required. Recommendations have been supplied for avoidance of these effects. Alternative measures have been offered to minimise or remedy these effects if avoidance is not viable. In any case, every effort must be made to ensure there is 'no net loss' to ecological values of the site.

Appendix A – Supplementary Data Tables

Table 3 Plants Observed in Open Pasture Habitat on the planned site.

Abundance	Common Name	Latin Name	Conservation Status[10,11]
30%	Rough-stalked meadow grass	*Poa trivialis*	Introduced
25%	Narrowleaf plantain	*Plantago lanceolata*	Introduced
20%	Kikuyu	*Cenchrus clandestinus*	Weed
2%	Creeping buttercup	*Ranunculus repens*	Introduced
2%	Red Clover	*Trifolium pratense*	Introduced
2%	White clover	*Trifolium repens*	Introduced
Sporadic	Catsear	*hypochaeris radicata*	Introduced
Sporadic	Dallis grass	*Paspalum dilatatum*	Introduced
Sporadic	Self-heal	*Prunella vulgaris*	Introduced
Sporadic	Giant buttercup	*Ranunculus acris*	Introduced
Sporadic	Creeping speedwell	*Veronica filiformis*	Introduced
Sporadic	English daisy	*Bellis perennis*	Introduced

Table 4 Plant Species List - Mixed exotic-native bush patch

Estimated Canopy Cover	Common Name	Latin Name	Conservation Status[11,12]
20%	Eucalyptus	*Eucalyptus*	Introduced
20%	Pine	*Pinus*	Introduced
8%	Pūriri	*Vitex lucens*	Not Threatened
8%	Norfolk Island Pine	*Araucaria heterophylla*	Introduced
5%	Tōtara	*Podocarpus totara var. totara*	Not Threatened
5%	Cabbage Tree	*Cordyline australis*	Not Threatened
3%	Pōhutukawa	*Metrosideros excelsa*	Threatened – Nationally Vulnerable
3%	Red matipo	*Myrsine australis*	Not Threatened
2%	Chinese privet	*Ligustrum sinense*	Weed

[10] Weedbusters (2023). *Weed List.* Weedbusters. https://www.weedbusters.org.nz/what-are-weeds/weed-list/

[11] NZPCN (2023). *Flora Species.* New Zealand Plant Conservation Network. https://www.nzpcn.org.nz/flora/species/

[12] De Lange, P., Rolfe, J., Barkla, J., Courtney, S., Champion, P., Perrie, L., Beadel, S., Ford, K., Breitwieser, I., Schönberger, I., Hindmarsh-Walls, R., Heenan, P., & Ladley, K. (2017). *Conservation status of New Zealand indigenous vascular plants, 2017*. Department of Conservation.

Table 5 Plants observed in the remnant forest fragment bordering the proposed site. Dominant species noted by asterisk (*).

Common Name	Latin Name	Conservation Status[13]
Kānuka*	*Kunzea ericoides**	Threatened – Nationally Vulnerable
Tōtara*	*Podocarpus totara var. totara**	Not Threatened
Māhoe	*Melicytus ramiflorus* subsp. *ramiflorus*	Not Threatened
Pūriri	*Vitex lucens*	Not threatened
Hangehange	*Geniostoma ligustrifolium var. ligustrifolium*	Not Threatened
Lacebark	*Hoheria populnea*	Not Threatened
Lemonwood	*Pittosporum eugenioides*	Not Threatened
Nīkau	*Rhopalostylis sapida*	Not Threatened
Pigeonwood	*Hedycarya arborea*	Not Threatened
Ponga	*Alsophila tricolor*	Not Threatened
Rewarewa	*Knightia excelsa*	Not Threatened
Rimu	*Dacrydium cupressinum*	Not Threatened
Tānekaha	*Phyllocladus trichomanoideas*	Not Threatened
Taraire	*Beilschmiedia taraire*	Not Threatened
Lacebark	*Hoheria populnea*	Not Threatened
Kiekie	*Freycinetia banksia*	Not Threatened
NZ Passionflower	*Passiflora tetrandra*	Not Threatened

[13] De Lange, P., Rolfe, J., Barkla, J., Courtney, S., Champion, P., Perrie, L., Beadel, S., Ford, K., Breitwieser, I., Schönberger, I., Hindmarsh-Walls, R., Heenan, P., & Ladley, K. (2017). *Conservation status of New Zealand indigenous vascular plants, 2017*. Department of Conservation.

Table 6 Birds observed in the proposed site. Note some species were not observed onsite but have been recorded in similar habitat in a surrounding 1km radius, indicating potential for usage of the site.

Common Name	Latin Name	Conservation Status[14]		Observed Onsite	Observed habitat usage
Kererū (New Zealand Wood Pigeon)	*Hemiphaga novaeseelandiae*	Endemic	Not threatened	No	Remnant forest, bush patches
Tuī	*Prosthemadera novaeseelandiae novaeseelandiae*	Endemic	Not threatened	Yes	Remnant forest, bush patches
North Island Fantail	*Rhipidura fuliginosa placabilis*	Endemic	Not threatened	No	Remnant forest
Pūtangitangi (Paradise Duck)	*Tadorna variegata*	Endemic	Not threatened	No	Pasture
Common myna	*Acridotheres tristis tristis*	Introduced	-	No	Pasture, remnant forest
California quail	*Callipepla californica*	Introduced	-	No	Pasture
Goldfinch	*Carduelis carduelis*	Introduced	-	Yes	Pasture
European greenfinch	*Carduelis chloris*	Introduced	-	No	Pasture
Australian magpie	*Gymnorhina tibicen*	Introduced	-	Yes	Pasture, bush patches
Welcome swallow	*Hirundo* neoxena	Introduced	-	Yes	Pasture
European House Sparrow	*Passer domesticus domesticus*	Introduced	-	Yes	Pasture
Eastern rosella	*Platycercus eximius*	Introduced	-	No	Pasture, remnant forest
Malay spotted dove	*Streptopelia chinensis tigrine*	Introduced	-	No	Pasture, remnant forest
Blackbird	*Turdus merula*	Introduced	-	No	Pasture, bush patches, remnant forest
Song thrush	*Turdus philomelos clarkei*	Introduced	-	No	Pasture, remnant forest
Pīpīwharauroa (Shining Cuckoo)	*Chrysococcyx lucidus lucidus*	Native	Not threatened	No	Remnant forest
Kāhu (Swamp harrier)	*Circus approximans*	Native	Not threatened	No	Pasture
White-faced Heron	*Egretta novaehollandiae*	Native	Not threatened	No	Pasture
Kōtare (New Zealand Kingfisher)	*Todiramphus sanctus vagans*	Native	Not threatened	No	Pasture
Spur-winged plover	*Vanellus miles novaehollandiae*	Native	Not threatened	Yes	Pasture

[14] Robertson, H. A., Baird, K. A., Elliott, G., Hitchmough, R., McArthur, N., Makan, T., ... & Michel, P. (2021). *Conservation status of birds in Aotearoa New Zealand, 2021*. Department of Conservation, Te Papa Atawhai.

Table 7 Lizard species potentially present on site, based on species range[15], habitat preference, and recorded observations.

Common Name	Latin Name	Conservation Status[16]		Observed in surrounding area
Copper skink	*Oligosoma aeneum*	Endemic	At Risk - Declining	Yes
Ornate skink	*Oligosoma ornatum*	Endemic	At Risk – declining	Yes
Plague skink	*Lampropholis delicata*	Exotic	Introduced and naturalised	Yes
Auckland Green Gecko	*Naultinus elegans elegans*	Endemic	At risk – declining	No
Forest Gecko	*Mokopirirakau granulatus*	Endemic	At risk - declining	No
Pacific Gecko	*Dactylconemis pacificus*	Endemic	Not Threatened	No

Table 8 Native freshwater species observed in the nearby Puhinui Stream

Species Name	Common Name	Conservation Status[17][18]
Paranephrops planifrons	Northern koura (crawfish)	Not threatened
Sigara	Water boatmen	Not threatened
Echyridella menziesii	New Zealand freshwater mussel	At risk - declining
Potamopyrgus antipodarum	New Zealand Mudsnail	Not threatened
Microvelia macgregori		Data deficient
Latia neritoides	Limpet	Not threatened
Gobiomorphus cotidianus	Common bully	Not threatened
Anguilla australis	Shortfin eel	Not Threatened

[15] The New Zealand Herpetological Society (n.d.) *Herpetofauna Index.* New Zealand Herpetological Society. https://www.reptiles.org.nz/herpetofauna

[16] Hitchmough, R., Barr, B. P., Lettink, M., Monks, J. M., Reardon, J. T., Tocher, M., ... & Rolfe, J. R. (2013). *Conservation status of New Zealand reptiles, 2012*. Publishing Team, Department of Conversation.

[17] Grainger, N., Collier, K. J., Hitchmough, R., Harding, J. S., Smith, B. J., & Sutherland, D. L. (2018). *Conservation status of New Zealand freshwater invertebrates, 2018*. Publishing Team, Department of Conservation.

[18] Dunn, N. R., Allibone, R. M., Closs, G., Crow, S., David, B. O., Goodman, J., ... & Rolfe, J. R. (2017). *Conservation status of New Zealand freshwater fishes, 2017*. Publishing Team, Department of Conservation.

Appendix B – Supplementary Maps

Figure 9 Current extant ecosystem types at the site. WF12 = Kauri, podocarp, broadleaved beech forest; WF9 = Taraire, tawa, podocarp forest. Site outline shown in red. Source: Auckland Council Geomaps

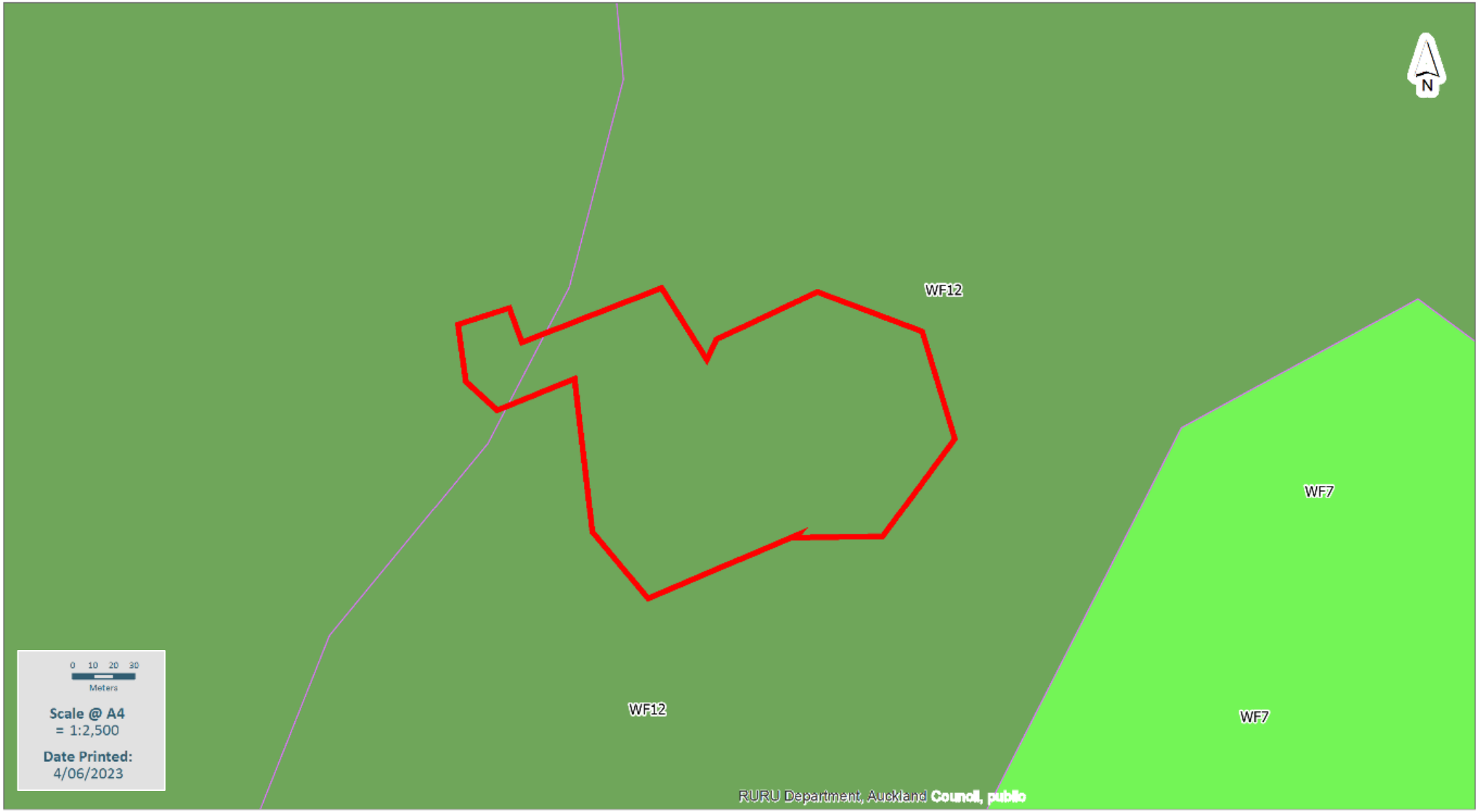

Figure 10 Potential ecosystem types. Site outline shown in red. Source: Auckland Council Geomaps

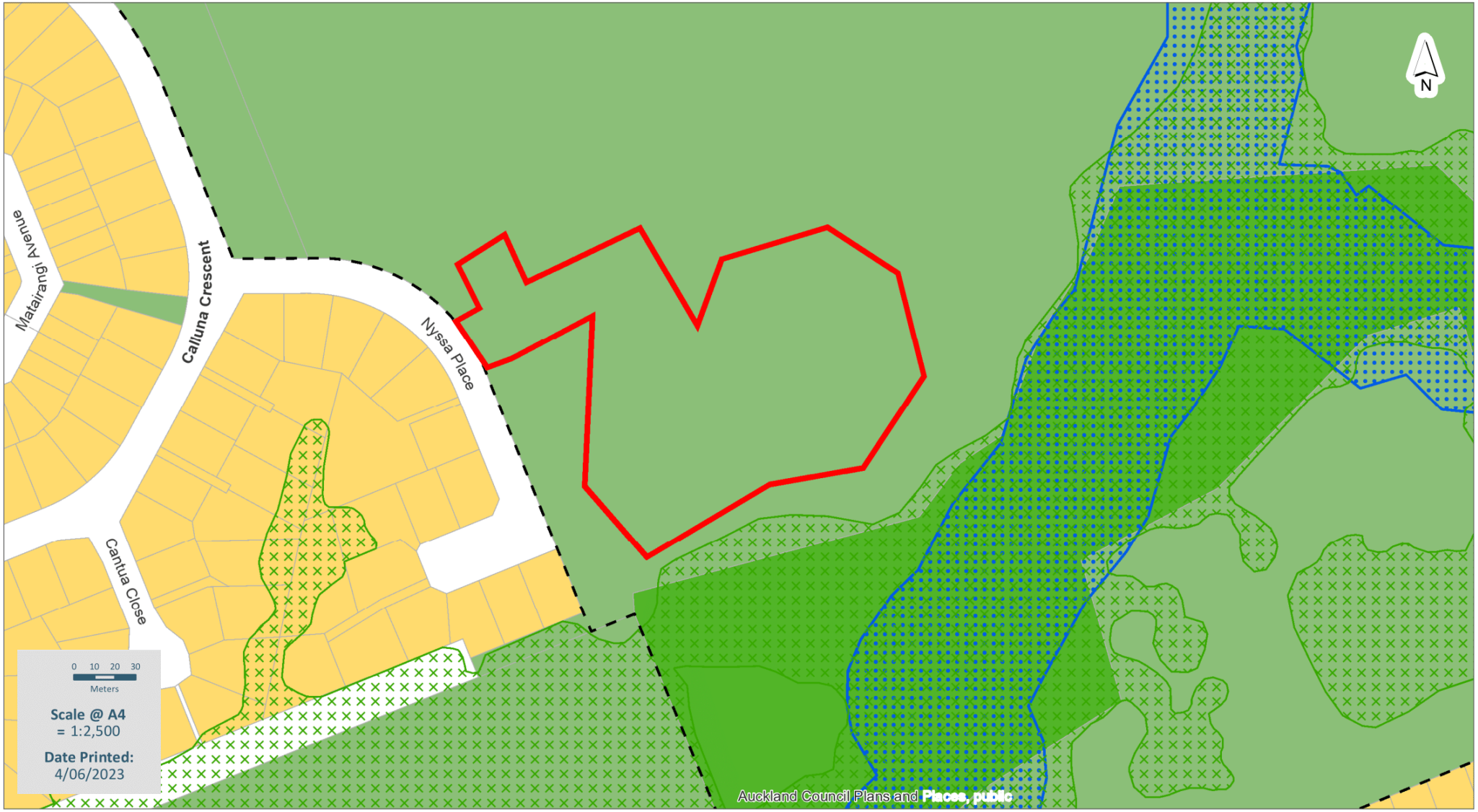

Figure 11 Ecologically-significant areas on near the site. Significant Ecological Area (SEA) forest marked by green crosses, and Natural Stream Management Area (NSMA) marked by blue dots. Source: Auckland Unitary Overative Planning Maps Viewer.