Before the Expert Consenting Panel

under: the Fast-track Approvals Act 2024 (*FTAA*)

in the matter of: notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities by the NZ Transport Agency Waka Kotahi to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills Project, a state highway from the intersection of State Highway 1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

applicant: **NZ Transport Agency Waka Kotahi**

Requiring Authority and Applicant

Statement of Evidence of Vaughan Keesing for NZ Transport Agency Waka Kotahi

Dated: 28 October 2026

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STATEMENT OF EVIDENCE OF VAUGHAN KEESING

INTRODUCTION

1 My full name is Vaughan Francis Keesing.

2 I am a Senior Ecologist and Director with the consulting firm of BlueGreen Ecology Limited. My qualifications include a B.Sc. (Hons, 1st) in Zoology and a Ph.D. in Ecology, both from Massey University, as well as a Certificate in Research Statistics. I have been a consulting ecologist for the last 28 years. My skills lie in community ecology. I have specialist skills in the areas of plant ecology, entomology and freshwater ecology including wetlands. I have worked extensively in freshwater and terrestrial habitats throughout New Zealand. An overview of my relevant experience and qualifications is attached as **Appendix A** to this statement.

3 I have been engaged to assist the NZ Transport Agency Waka Kotahi *(NZTA)* as part of notices of requirement and applications for resource consents, wildlife approvals and archaeological authorities (together, the *Application*) to develop the Brynderwyn Hills section of the Alternative to the Brynderwyn Hills (*Project*), a state highway from the intersection of SH1 and Baldrock Road in the south, through the Brynderwyn Hills to Waipū in the north.

4 I have been involved in the Project since April 2025 as the Project's lead freshwater ecology expert. I am the author of the Assessment of Effects on Freshwater Ecology lodged on 8 April 2026 in support of the Project (*Freshwater Assessment*).[1]

5 In my role, I have undertaken desktop research, designed field visit requirements, collected field data and supervised other freshwater ecologists from WSP NZ Limited to do the same, analysed the results of the data collection and assessed potential effects on freshwater ecology. As part of this role, I have engaged with other members of the Project team relating to stormwater, hydrology, earthworks, sediment and erosion control, terrestrial ecology, avifauna, and planning. I was also involved in several Multi Criteria Analysis processes, contributing inputs relating to freshwater ecology.

CODE OF CONDUCT

6 Although this matter is not before the Environment Court, I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses in its Environment Court Practice Note 2023. I agree to comply with that Code. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to

[1] Vol B, Appendix D07 – Assessment of Effects on Freshwater Ecology (*Freshwater Assessment*).

consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

7 My evidence addresses (separately for both natural inland wetlands and freshwater ecology):

7.1 A summary of my Freshwater Assessment, particularly as it relates to comments received;

7.2 My recommended approach to addressing effects on freshwater and natural inland wetlands; and

7.3 Responses to specific comments from:

(a) The Department of Conservation on behalf of the Director General of Conservation (*DOC*);

(b) Te Uri o Hau Settlement Trust on behalf of Te Uri o Hau hapū (*Te Uri o Hau*);

(c) Te Pouwhenua o Tiakiri Kūkupa Trust on behalf of Te Parawhau hapū (*Te Parawhau*); and

(d) Patuharakeke Iwi Trust Board (*Patuharakeke*).

PART A – SUMMARY OF ORIGINAL ASSESSMENT – WETLANDS

8 In this section, I provide a summary of the natural inland wetlands section of my Freshwater Assessment, including my assessment methodology, identification and classification of natural inland wetlands and my assessment of effects on wetland ecology.

9 At the outset, I note that throughout the remainder of this brief where I reference "Wetlands", I am referring to natural inland wetlands (as defined in the National Policy Statement for Freshwater Management 2020 (*NPS-FM*)).[2] Where I reference numbered Wetlands, these are cross-references to those within the Proposed Designation, as shown on the map in **Appendix B**.

Assessment methodology – Wetlands

10 My approach to identifying Wetlands and evaluating their extent and value is outlined in sections 2.2.5 – 2.2.8 of the Freshwater Assessment.

[2] National Policy Statement for Freshwater Management 2020 (consolidated with December 2025 amendments) (*NPS-FM*). I note the Regional Plan for Northland also adopts the same definition for natural inland wetlands (Regional Plan for Northland, Part B – Definitions at page 22).

11 In essence, I looked for potential Wetlands using aerial photography and Council databases.[3] Then, and depending on access permission, these locations were visited and features observed using the Wetland rapid assessment test.[4] The dominant species, character and condition of each feature was recorded and photographs were taken. I used the rapid assessment test method (observation of FACW-OBL dominance) to determine whether features met the definition of a Wetland or not. As part of this assessment, I took a conservative approach to considering whether features possibly met the pasture exclusion exception (i.e. I did not exclude features with saturated soil and wet adapted vegetation even though they were likely pasture).[5] Where access was not allowed and I considered the presence of a Wetland likely, these were included as 'potential Wetlands' and considered as part of the Freshwater Assessment. Where I did not consider the presence of a Wetland to be likely (i.e. an absence of landform and vegetation cover by aerial suggestive of wetland), these features were not considered further.

12 For determining each Wetland's respective values, I considered exotic species dominance, hydrology, condition, accessibility of farming and stock practices (i.e. ecosystem health) and hydrological functional value. No detailed species lists or faunal surveys were conducted. In my opinion, the level of modification in the great majority of these features, as well as the ongoing extent of farm use, generally precludes the presence of rare and threatened plant species.

13 None of the exotic dominated Wetlands I observed (and assessed as having low or negligible value based on their vegetation related values) contained habitat suitable for valued taxa (such as mudfish or tuna (longfin eels)). Therefore, I considered the risk of these taxa being present as highly unlikely. Further, if these species were present, I consider that such species would only be in very low numbers, such that best practice survey effort would be unlikely to find them.

14 By contrast, the Wetlands I assessed as having moderate or higher value based on their vegetation (even without a full species list) had already been established as having that value, and therefore did not require further faunal or species surveys to confirm it (noting that there are processes to salvage species from areas where Wetlands

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[3] The search is reliant on good aerial imagery that shows vegetation differentiation well and, on the extent, and accuracy of Council data. Thus it is that nuanced wetlands, those typically in pastural settings, do not always distinguish themselves in poorer quality aerial photography.

[4] See: Ministry for the Environment. 2022. Wetland delineation protocols. Figure 1, section 3, and figure 2,where observation of Facultative Wetlands (*FACW*) and Obligate Wetlands (*OBL*) species can determine the presence of a wetland.

[5] See: Ministry for the Environment. 2022. Pasture exclusion methodology, included by reference in the NPS-FM, which allows certain wetland features to be excluded as pasture.

are removed, so that any rare taxa are recovered before being impacted by construction activities).

15 I consider my approach was appropriate because of the extent of the geographic area being considered, and the obviously degraded / modified condition of most features meaning any simplistic exotic systems were clearly observable. Furthermore, there will always be a need for a secondary process of Wetland identification in the future once detailed design has been completed and the actual alignment is fixed. I understand that construction may be several years or more into the future, at which point the condition / associated value and extent of any of these Wetland features may be considerably different than they are today (whether for the better or worse).

16 Given the land use and landscape within which these features sit (i.e. a long history of modification and use resulting in transient, simple, exotic dominated features apt to change with changing land use), I remain of the opinion that my methodology is sufficient and robust for assessing the presence, area and value of Wetland features within the Proposed Designation, and for understanding the level of effect and the necessary management of those effects. My methodology does not focus extensive study on every Wetland. Rather, the distinction between low and negligible value Wetlands, and moderate and higher value Wetlands, is made in the field by observation, and is clear and obvious because it relates to observable condition and the extent of indigenous plant species.

17 The outcome of that differentiation is that low and less valuable Wetlands are not, as a rule, proposed to be subject to effects management, as replacing low value exotic systems with an equivalent value Wetland gains nothing towards indigenous Wetland protection or retention (as I explain further in the Wetland mitigation package section below). By contrast, and irrespective of the magnitude of effect, the moderate and higher value Wetlands will be subject to effects management measures.

18 Distinguishing between these two groups does not require detailed fish, plant and invertebrate surveys of every Wetland to find rare taxa in what are highly modified features in a highly modified landscape. In my experience, such detailed study, irrespective of the time and cost involved, will inevitably return results that, where negative, are not accepted, with continued criticism of insufficient survey effort. In my opinion, the risk of a low value feature properly being classified as moderate value because of a rare and hidden taxa population is very low in the landscape of the Project area.

Identification of Wetlands and associated extent

19 As noted above, access restrictions meant I was not able to ground truth all features. Either myself, or the WSP ecologists, undertook field surveys of 24 features (see section 3.1 and Table 4 of the

Freshwater Assessment). For the features we could not access, I examined aerial photography to determine the likely condition of each feature and whether it needed to be included.

20 Following lodgement, and in consultation with the DOC experts (who were able to access several of the properties that I could not), I have considered the extent to which there are additional Wetlands within the Proposed Designation not captured in my Freshwater Assessment (discussed further in Part C below). Through this exercise, I accept that the 15 additional Wetlands identified by DOC are within the Proposed Designation. All but three of these Wetlands are of low-negligible value in highly modified pastural condition. Two are of moderate value and contain greater indigenous species representation, although they remain exposed to farming and therefore may not persist into the future. The one high value Wetland identified (new Wetland 38) is not currently within the Indicative Alignment.

21 At present, I consider that there are 39 identified Wetlands within the Proposed Designation. For completeness, I have prepared an amended version of Table 4 of the Freshwater Assessment (outlining the Wetlands within the Proposed Designation, their anticipated extents and values) and map reflecting these areas in **Appendix B**.

22 I have not specifically considered Wetlands beyond the Proposed Designation (other than those registered in the Council maps of Significant Natural Areas and identified Wetlands, noting none were obvious along the Proposed Designation boundary). I am confident from the hydrological modelling and the likely areas where large cuts will be located (notably centrally for the Indicative Alignment), that it is unlikely that there will be any hydrological disturbance to any potential Wetland beyond the Proposed Designation boundary, or for that matter within the Designation other than those I have specifically identified (even if the alignment was to move).

Classification of Wetland value

23 In this section, I will address:

23.1 Factors influencing my classification of Wetland value;

23.2 Value classification for Wetlands within the Proposed Designation; and

23.3 Relevance of limited fauna and flora surveys for my value classifications.

Factors influencing classification of Wetland value

24 I used the criteria in Appendix 1A of the NPSFM to classify the value of Wetlands within the Proposed Designation. These criteria require consideration of different aspects including ecosystem health, indigenous biodiversity, hydrological function, Māori freshwater

values and amenity.[6] I have not personally considered Māori freshwater values in my assessment (i.e. mahinga kai and any other value determined collaboratively between tangata whenua and the relevant regional council), as that is a matter more appropriately assessed by tangata whenua and also outside of my expertise.

25 When assessing a Wetland's overall value, determining its ecosystem health (a condition based consideration) and indigenous biodiversity values are obvious because these aspects are directly observable.[7] Where Wetlands are dominated by exotic species and have a poor condition (i.e. because they are located in areas highly modified by surrounding land uses such as stock access, fertilisers, ploughing, over seeding etc which have direct observable effects to a feature), the hydrological functional aspects may be less obvious.

26 This situation (i.e. the absence of condition and indigenous biodiversity) was the case for the majority of Wetlands within the Proposed Designation, but only a speculative assessment of their hydrological function could be made. I have used research to infer the likely hydrological functions of wetlands in farmed landscapes.[8] Having considered each of these Wetlands and their respective condition, obvious species, sizes and situation (all the low and lower value features identified), I am of the opinion that most exotic dominant, poor condition Wetlands do not have (in addition to health and indigenous biodiversity) hydrological functions that are meaningful to the catchment such that they warrant protection from an ecological perspective.

27 Some researchers suggest that Wetlands offer up to 22 functions.[9] Most of these functions are human use related (i.e. amenity, farm profitability, fibre gathering, fishing, gathering food, swimming, boating, forage for livestock, agricultural productivity, art, bee foraging, education, relaxation). Other functions are ecological, which primarily relate to indigenous biodiversity, stormwater retention, water treatment, indigenous faunal habitat and potentially erosion protection.

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6 That is, the condition of the feature and its elements in terms of level of damage, stress, toxins, balance of nutrients, etc, the extent and amount of cover of expected (if representee) indigenous plants and animals, ability to receive, hold, treat and discharge water.

7 I note the only exception to this is the presence of cryptic marsh bird species. However, I understand their presence has been conservatively assumed based on the presence of potential habitat by Dr Bull.

8 Stephanie A. Tomscha, Shannon Bentley, Elsie Platzer, Bethanna Jackson, Mairead de Roiste, Stephen Hartley, Kevin Norton & Julie R. Deslippe (2021) Multiple methods confirm wetland restoration improves ecosystem services, Ecosystems and People, 17(1) (*Tomscha et al. (2021)*) and Tanner, C.C., Sukias, J.P., 2011. Multiyear nutrient removal performance of three constructed wetlands intercepting tile drain flows from grazed pastures. Journal of environmental quality 40 (*Tanner et al. (2011)*)..

9 Tomscha et al. (2021) at pages 25-40.

28 Indigenous biodiversity is not present in the lower value Wetland systems. Research has shown that while farmed exotic Wetlands with a degree of hydrological function may provide opportunities for restoration (which then can bring better indigenous biodiversity and hydrological functionality to these features),[10] prior to that restoration those functional values are not present (which is the case for the great majority of onsite Wetlands assessed). Furthermore, whilst such Wetlands have been found to retain nitrogen but release phosphate,[11] other research suggests that these pastural Wetlands do not perform nutrient remediation any better than the pasture itself.[12] Accordingly, these combined factors (i.e. poor condition, lack of indigenous biodiversity value and lack of hydrological functionality) have strongly influenced my classification of negligible and low value Wetlands.

29 Some ecologists suggest that aspects that offer the potential for a future improved condition should be considered as part of a Wetland's current value. However, I disagree. Such a consideration would require speculation as to future land use changes and a willingness to expend resources on restoration where no land use change has occurred in that location for a considerable length of time.

30 The difference between negligible and low value Wetlands is a fine line. In my Freshwater Assessment, various factors led to my classification of Wetlands as negligible, as opposed to low value, including:

30.1 the dominance of exotic species;

30.2 location in a farmed landscape that may be influenced by farming inputs of fertilisers, stock access and potential land use changes (cropping, ploughing etc); and

30.3 absence of any meaningful wetland functions (indigenous biodiversity, size, faunal habitat, water storage, seasonal water support to streams, water treatment, amenity, food resource kai etc).

Wetland values within the Proposed Designation

31 A summary of Wetland values within the Proposed Designation is outlined in Table 1 below. Most Wetlands within the Proposed Designation are of negligible or low ecological value (i.e. 24 of 39 features). Four Wetlands (Wetlands 25, 27, 28, Q08/066) are of

[10] Tomscha et al., 2021.

[11] Tanner et al., 2011, at pages 620–633.

[12] Luo, J., Ledgard, S., De Klein, C., Lindsey, S., Kear, M., 2008. Effects of dairy farming intensification on nitrous oxide emissions. Plant and Soil 309, at pages 227–237; Zaman, M., Nguyen, M., Blennerhassett, J., Quin, B., 2008. Reducing NH3, N2O and–N losses from a pasture soil with urease or nitrification inhibitors and elemental S-amended nitrogenous fertilizers. Biology and fertility of soils 44, at pages 693–705.

moderate value (as an averaged condition, because the Wetlands are not uniform in respect to plant cover and other condition factors across the entire feature). Four Wetlands have high value (Wetlands 24, 38, 8, 16), and two otherwise low value Wetlands have high value habitat to special fauna (Wetlands 12 and 13 for fern bird). Five have no current assessed value due to an inability to access that land but are likely low or less given their situation (i.e. farmed, open vegetation, narrow gullies). I understand Mr Singers' evidence supports my values assessments for Wetlands 1-24, as well as Wetlands 25-39. I note that he has also removed Wetland 19 as a created wetland.

Table 1 – Wetland value within the Proposed Designation		
Value	**Number of features**	**Total area (ha)**
High (including those low value Wetlands that provide avifauna habitat)	6	7.02
Moderate	4	5.29
Low or negligible	24	10.3
Unknown	5	2.62

32 For completeness, I note that the low and negligible value exotic dominated wetlands within farmed landscapes are not rare and do not trigger rarity in the values assessment. They are common in the Ecological District lowlands, and while their extent has not historically been mapped, they do not form part of the calculation (Ausseil[13]) as to the amount historically present wetland that is now regionally of remaining indigenous Wetland (3.9%).

33 The moderate and high value Wetlands within the Proposed Designation are also not representative of quality indigenous Wetlands (i.e. they are still species poor, modified, relatively simple and small features). However, given the paucity of these types of Wetlands in this farmed landscape, they are some of the better remaining examples and therefore have been assigned a higher value classification.

34 The five Wetlands with unknown value are located in the upper Waihoihoi catchment, whose catchment heads are just north of State Highway 1. Given their situation, I expect that their value is likely to be low or less. However, NZTA's revised conditions will require these Wetlands to be surveyed when access is allowed, to determine their respective value and therefore whether they should

[13] Ausseil, A.-G., Gerbeaux, P., Chadderton, W.L., Stephens, T., Brown, D., Leathwick, J., 2008. Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important inland wetlands. Landcare Research Contract Report LC0708/158.

be subject to restoration or offsetting (as outlined in the Wetland mitigation package section below).

Relevance of limited fauna and flora surveys for my value classifications

35 As outlined above, none of the 39 identified Wetlands have received detailed surveys to identify the presence of threatened or at-risk flora or fauna. I do not consider that impacts my classification of Wetland value for the purposes of assessing effects for the following reasons:

35.1 The 24 negligible / low value Wetlands are highly unlikely to support such special flora or fauna because of their situation (i.e. poor condition, stock eaten, trampled, pugged soils, defecated in, exotic species dominated, and some with recognised weeds). The exception is Wetlands 12 and 13 which, as outlined in the Avifauna Assessment,[14] have reports of the presence of an At Risk – Declining bird (i.e. fern bird), which will still utilise such habitats where they are part of that taxa's home range. Their presence does not indicate good quality Wetland habitat, but rather sufficient edge cover adjacent to the herbaceous Wetland in which they may feed. The associated wetland habitat of Wetlands 12 and 13 remains in poor condition, with predominantly exotic species cover and stock effects.

35.2 The moderate and high value Wetlands are nevertheless still small, and still highly modified and simple systems. Accordingly, I consider these are unlikely to be reservoirs for threatened or atrisk taxa.[15]

36 I acknowledge that despite black mudfish not being common in Northland Regional Council fish survey records (and generally not indicated in the southeast of the region where the Project is located), in lieu of eDNA surveys, their presence cannot be entirely ruled out in certain types of Wetlands. Specifically, those which are or have been connected to waterways and which contain deeper surface water (i.e. Wetlands: 2, 8, 16, 24 and Q08/066). Survey for these species is problematic, especially in fully vegetated Wetlands where the chance of survey providing an accepted negative is limited.

37 If black mud fish were found and in numbers suggesting a viable population, that would change the value assessment in Wetlands valued as low or less. However, in my opinion the risk of that occurring is very low given the conditions of these Wetlands. If black mudfish were found in the moderate or high value Wetlands (which is more probable), then I do not consider that the effect on

[14] Appendix D08 - Assessment of Effects on Avifauna Ecology, section 3.1.3 at page 23.

[15] Wetlands 25, 27, 28, Q08/66, 24, 8, 16, 38, 12 and 13.

the values assessment would materially change, in that the values are already at least moderate, any features valued moderate or higher will be managed the same (through offsetting and requirements for pre-construction salvage).

Assessment of effects on Wetland ecology

38 Not all of the identified Wetlands are impacted by the Indicative Alignment. To inform my assessment, I had a GIS expert overlay the Indicative Alignment and associated spoil sites with the identified Wetlands to estimate the extent of impact (for each Wetland individually, and as a sum).

39 The quantum of each Wetland (split per catchment) that is under the Indicative Alignment (and associated spoil sites) is outlined in Section 4.3, Table 18 of my Freshwater Assessment.[16] Wetlands 2, 3, 4, 11, 12, 13, 14, 20, 21, 23 and 24 are either fully or partially impacted by the Indicative Alignment or spoil sites. In addition, Wetlands 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37 (identified following lodgement of my Freshwater Assessment), are also impacted. An estimate of the potential impacts on these additional wetlands is outlined in Table 2 below.

Table 2 – Additional Wetland areas (m^2) impacted by works associated with the Indicative Alignment

Wetland impacted by Indicative Alignment & catchment	Wetland impacted in m^2 per catchment	Effect as a proportion (%) of known wetlands in the Project area in each catchment[17]
2 (Waihoihoi)	2500	2.38%
3 (Waihoihoi)	600	0.57%
4 (Waihoihoi)	2700	2.57%
11 (Waihoihoi)	2000	1.91%
12 (Waihoihoi)	3600	3.43%
13 (Waihoihoi)	2700	2.57%
14 (Waihoihoi)	5000	4.77%
20 (Wairau)	100	0.19%
21 (Wairau)	100	0.13%

[16] Freshwater Assessment, section 4.3 at page 49.

[17] The Wetland area in the Proposed Designation per catchment has been updated since the Freshwater Assessment was lodged based on the additional Wetlands have been added. I note that this is more a zone of influence scale rather than a catchment scale, given most of the pastural Wetlands in the catchments of the broader Project area have not been mapped.

Table 2 – Additional Wetland areas (m^2) impacted by works associated with the Indicative Alignment		
Wetland impacted by Indicative Alignment & catchment	**Wetland impacted in m^2 per catchment**	**Effect as a proportion (%) of known wetlands in the Project area in each catchment[17]**
23 (Wairau)	298	0.39%
24 (Wairau)	10500	13.76%
25 (Wairau)	1,858	2.43%
27 (Wairau)	2,400	3.14%
28 (Wairau)	1,900	2.49%
29 (Wairau)	1,300	1.70%
30 (Wairau)	25,995	34.06%
31 (Wairau)	1,484	1.94%
32 (Wairau)	4,500	5.90%
33 (Wairau)[18]	40,000 (Singers)	52%
34 (Waihoihoi)	6,800	6.49%
35 (Waihoihoi)	2,600	2.48%
36 (Waihoihoi)	3,200	3.05%
37 (Waihoihoi)	3500	3.34%
38 (Waihoihoi)	4400	4.20%

40 Based on the above, the total loss from the Indicative Alignment is:

40.1 2.11ha for moderate and high value Wetlands;

40.2 8.96ha for low and negligible value Wetlands; and

40.3 2.05ha for unknown value Wetlands.

41 I currently assume that the unknown wetlands are of low or less value making the likely total area of low and less value wetlands is approximately 7ha.

[18] Neither DOC nor I have seen the full extent of this feature anticipated to be located under a proposed spoil site (which may be more like 2ha). Mr Nicholas Singers, who undertook a Wetland survey for these additional wetlands, measured the area as closer to 4ha. The exact area affected and present remains as yet undetermined, although all agree its value is low or less.

42 I determined the extent (magnitude) of effect on each of the impacted Wetlands by estimating the proportion of that impact relative to the number of known Wetlands in the broader catchment (which is the Project envelope or zone of influence). I then represented this finding as a % of Wetland loss per catchment. I consider this to be a very conservative approach because of the absence of district-wide ecological NPS-FM Wetland mapping, the failure to recognise these features as "Wetlands" in the past and the fact that these features are not accurately identifiable using aerial images. In light of these factors, and because low and negligible farm-scape Wetlands are generally abundant, the total "population" being compared against in my assessment is under-represented.

43 I consider that the magnitude of loss, based on % of impact relative to the broader catchment, was:

43.1 Negligible where the loss was <1%;

43.2 Low where the loss was >1-10%;

43.3 Moderate where the loss was >10-25%;

43.4 High where the loss was >25-50%; and

43.5 Very High >50%.

44 I then used the value, extent and magnitude of effect for each Wetland to determine the level of effect, as per the effects matrix in the Ecological Institute of Australia and New Zealand guidelines for Ecological Impact Assessments (*EIANZ 2018*).[19]

45 Wetlands with low or negligible values which are affected by a low or less magnitude of impact result in a very low (less than minor) level of effect. Considering Wetlands impacted by the Project, that finding accounts for all of the 24 low or negligible value Wetlands. Without any remedial actions, those Wetland losses ~5-11ha (depending on the condition of Wetlands 34-38 and actual area of Wetland 33) equate to a less than minor adverse effect at the catchment zone of influence scale.

46 I have prepared a summary of the overall level of effects on Wetlands impacted by the Project in Table 3 below, including the additional Wetlands identified following lodgement of my Freshwater Assessment.

[19] Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition (*EIANZ Guidelines*), section 6.4.3, Table 10 at page 84.

Table 3 – Level of effect for Wetlands impacted by the Project				
Wetland (area affected in hectares)	**Value**	**Magnitude**	**Level**	**Notes**
12 (0.36)	High	Low	Low (minor)	Most of feature lost
13 (0.27)	High	Low	Low (minor)	Small amount of feature lost
24 (1.05)	High	Moderate[20]	High	~30% of feature lost
27 (0.24)	Moderate	Low	Low	All lost
28 (0.19)	Moderate	Low(19)	Low	All lost
33 (4.0)	Low	Low or very high depending on final measured extent.	Very low or Moderate[21]	All or most under a proposed fill site
Other surveyed Wetlands (4.96)	Low or negligible	Low or very low	Very low	Very little lost or even under the current alignment and fill sites (80% retention)[22]
Other non-surveyed Wetlands (2.05)	N/A	N/A	N/A	All or mostly lost

Implications for conclusions in Freshwater Assessment

47 The additional Wetlands outlined above do not change my conclusion as to the overall level of effects on Wetlands. Prior to mitigation, I consider the overall level of effects on Wetlands is:

47.1 Less than minor for low and negligible value Wetlands (in terms of both value and extent). As outlined in the Freshwater Assessment, these Wetlands are in poor condition and have an absence of indigenous biodiversity values, ecological functions, hydrology and amenity.[23]

[20] Amended following the addition of more Wetland area in this catchment making the denominator in the proportional equation larger.

[21] With respect to Wetland 33 it is, all agreed, a low value wetland (i.e. a pastural exotic dominant one), and in which case despite the moderate level of effect, there is no proposal to manage that quality of Wetland. In a similar vein, the moderate wetlands are affected in only a less than minor way but are to be offset.

[22] From observation of the mapping and alignment details.

[23] Freshwater Assessment, Section 3.1.1 pages 21-22.

47.2 Low (minor) for moderate value Wetlands. While these Wetlands are still considerably modified, in farmland and vulnerable to farm related changes, they do currently have a reasonable proportional cover of several common indigenous species which in the landscape involved raises them above the exotic dominated poor condition features.

47.3 High (more than minor) for high value Wetlands. These Wetlands are those which have the majority of the surface covered in indigenous species, and while still modified, are likely to have faunal habitat values and some hydrological functions.

48 Ultimately, I have not relied on the EIANZ matrix outcome (value versus magnitude of effect) to determine effects management, which makes the discussion on magnitude somewhat moot. Instead, I have determined that moderate and higher value Wetlands, given the paucity of Wetlands in the broader Project area and Ecological District, warrant effects management measures. By contrast, the low and less valuable Wetlands require no effects management, because they have very little or no indigenous biodiversity, representativeness, ecosystem health or hydrological functions.

49 While neither I (nor DOC) have assessed Wetlands 34-38, the aerial location and situation suggests that they will be no different than Wetlands 11, 12, 13, 14 and 15 (in that they are narrow headwater gullies with wet soil bases, with accumulated sediments surrounded by sparse shrubland in farmland which is open to grazing). I expect these features are exotic dominated, herbaceous and pasture damp adapted species (such as, rushes, Gylceria, willowherb, waterpepper, creeping bent and buttercup). Therefore, I consider that these features are likely to be low or less value, as they are not representative, and have low diversity, no rarity and little contextual value. Nevertheless, the values of these features can be confirmed by a pre-construction survey, to determine the implementation of appropriate effects management measures.

50 Through the refinements to NZTA's proposed mitigation package, any changes in design and the area of impact or confirmation of alternative Wetland values, will ensure that effects management requirements can respond to the actual effect of the Project (through offsetting).

51 As explained above, effects management for low and less valuable Wetlands is not necessary because they do not have the overarching NPS-FM values (indigenous biodiversity, hydrological function, ecosystem health, condition and amenity). Accordingly, in my opinion, it does not matter how many of these lower value Wetlands are affected by the final alignment, and I do not consider it necessary for there to be a cap on the extent of Wetland that can be impacted. For the moderate and higher value Wetlands, if

additional extent of these becomes affected, I consider that the current effects management measures will ensure effects on them are appropriately addressed.

WETLAND MITIGATION PACKAGE

52 This section will address NZTA's proposed mitigation package for managing effects on Wetlands.

53 At the outset, I note that the effects management hierarchy in the NPS-FM requires the sequential application of avoidance, minimisation and remediation where practicable, and where more than minor residual adverse effects remain, offsetting and then compensation where possible.[24]

54 Avoidance in my mind relates to features of particular value and whose characteristics or functioning cannot be replicated sufficiently (very high value features). None of those Wetland features are present in the Proposed Designation. I do note that the high value Wetlands were provided to the designers in workshops in an effort to minimise (where they could not be avoided) the extent of effects. Through this exercise, impacts on Wetland 24 were reduced (as were effects to Wetland 25). However, I do not consider this needs to be expressly required through the conditions.

55 Given the nature of the effects from the Project (a road surface with embankments or mounded spoil), I do not understand there to be much ability to remediate any affected moderate or high value Wetland features.

56 On that basis, I consider that offsetting is the only effect management option open to the effect on moderate and high value Wetlands. My conclusion would not change if additional low or negligible value Wetlands were impacted by the Project.

NZTA's proposed wetland mitigation package

57 NZTA's proposed effects management measures for Wetlands are outlined in the resource consent conditions. I understand these have been updated following lodgement of the Application.

58 By way of summary, these measures require:

58.1 Management of construction related discharges, including measures to manage concrete leachate, storage of fuels, lubricants, hazardous and or dangerous materials to avoid discharges and operation of machinery to avoid spillages of fuel, oil and similar contaminants;

58.2 Robust erosion and sediment control requirements;

[24] NPS-FM at cls 3.21 and 3.22.

58.3 A pre-construction survey undertaken by a Suitably Qualified Person to:

(a) confirm the extent and values of Wetlands that may be impacted by the Project and whether any provide habitat for cryptic marsh bird species. This is needed because the state and extent of most of these Wetlands will likely vary over time, including due to the farming and forestry activities in the broader landscape.

(b) Reasonably confirm or exclude the potential presence of mudfish in Wetlands that contain surface water and are either seasonally (or were once historically) connected to a stream; and

58.4 Where mudfish are identified through surveys, a requirement that these be salvaged (and relocated to an appropriate location) by a Suitably Qualified Person prior to the start of works that may impact the Wetland;

58.5 Offsetting for the loss of moderate and high value Wetlands through either creation or restoration at the ratios shown in Table 4 below.

Table 4 - Wetland creation and restoration ratios

Wetland Type	**Ratio**	
	Creation	**Restoration**
High Value Wetlands	(i) 1:2 (where the replacement Wetland(s) is Established within 2 to 5 years of the loss); or (ii) 1:1.5 (where the Wetland(s) is Established within 1 year of the loss); or (ii) 1:1 (where the replacement Wetland(s) is Established 3 years prior to the loss).	(i) 1:4 (where the Natural Wetland is restored within 5 years of the loss); or (ii) 1:3.5 (where the Natural Wetland is restored within 1 year of the loss); or (iii) 1:3 (where the Natural Wetland is restored 3 years before the loss).
Moderate Value Wetlands		(i) 1:3 (where the Natural Wetland is

		restored within 5 years of the loss); or (ii) 1:2.5 (where the Natural Wetland is restored within 1 year of the loss); or (iii) 1:2 (where the Natural Wetland is restored 3 years before the loss).

58.6 For Wetlands that are low or negligible value but provide habitat for cryptic marsh bird species (which would include Wetlands 12 and 13), I note that these must be restored or recreated at appropriate ratios, as determined by Dr Bull, NZTA's avifauna ecologist.

58.7 Preparation of a Wetland Management Plan (*WMP*), the purpose of which is to identify measures to achieve the offsetting outcomes noted above. The WMP must include various matters, including:

(a) specific requirements for restoring and creating Wetlands;

(b) provision for compensation where it is not practicable to achieve this (which I consider appropriate based on NZTA's proposed conditions); and

(c) monitoring and maintenance of Wetlands to achieve the outcomes above (including specific provision for groundwater monitoring of moderate and high value Wetlands that are at risk, but not confirmed to experience, groundwater drawdown, to determine if offsetting is required).

59 I note a few important points in respect to these updated effects management measures.

60 Firstly, the offsetting (and associated ratios) I've recommended are for the loss of herbaceous Wetlands. Areas of kahikatea forest that may be affected by the Project have been assessed in the Terrestrial Ecology Assessment and will be managed through the indigenous vegetation mitigation measures (including restrictions on works through NZTA's proposed avoid areas).[25]

[25] Designation Conditions, at Condition D1 and Appendix A.

61 Secondly, in my Freshwater Assessment I had recommended Wetland creation for offsetting purposes (in response to the directions in the NPS-FM). However, I consider that the restoration of existing negligible/low value features would be a better ecological outcome (where these have suitable hydrology) than creation. This is because without assistance, the existing negligible / low value features will continue to be farmed and will not be retained long term under current land uses, preventing these from achieving a better condition, or indigenous biodiversity or functional value, without direct restorative actions. Accordingly, I have recommended (and NZTA has adopted) optionality to undertake either Wetland creation or restoration as a means of offsetting the loss of moderate and high value Wetlands.

62 As noted above, I do not consider it necessary to offset the loss of any negligible/low value features, because the level of effect is less than minor without effects management (both for each Wetland and accumulated across all four catchments), and because there are no real "values" that require replacement.

63 I acknowledge that my recommendations are not entirely consistent with the NPS-FM directions in relation to no loss of extent. However, I do not consider that these features have any Wetland values identified by the NPS-FM that warrant protection, and therefore I do not consider it necessary to create an equivalent extent to address loss of value. It does not make sense to me from an ecological perspective to direct protection and persistence at features that do not have values warranting protection.

64 Offsetting under the NPS-FM is required to adhere to the principles in Appendix 6. In particular, the use of a like-for-like quantitative loss/gain calculation (but others also). If offsetting was required for negligible/low value exotic dominated Wetlands on a 'like for like' basis, the offset would be directed to return the same levels of exotic dominated Wetland in the same (or more) quanta (but fenced from stock and farming). While the net gain principle is preferable, it is not a bottom line. Additionality is a gain above what would otherwise occur without the Project, and therefore would be covered by a fenced offset. In my opinion, offsetting low value Wetlands on such a basis would not contribute to maintaining Wetlands with indigenous biodiversity and function, nor would it cause a betterment of Wetlands overall (in the Ecological District). I believe that this sort of undesirable offset outcome indicates the absence of actual values of these Wetlands.

65 Thirdly, as outlined above, there are some Wetlands that are not impacted by the Indicative Alignment but may be by the final alignment following detailed design. These Wetlands include some moderate and high value Wetlands (including Wetlands 8, 16, 25 and 38). The values of these Wetlands are reflected by the limited abundance in the Ecological District and makes the magnitude of potential effect higher. Therefore, I consider that these areas will

require effects management measures if affected in the future. That is because the resultant level of effect is at least moderate, but more importantly they have values in excess of the typical Wetland and so more than minor. As there are limited practicable opportunities to remedy the loss in area or value of these features, I recommend that these are addressed by way of an offset or compensation (as per the mitigations for moderate and high value Wetlands currently).

66 Fourthly, as noted above, I have considered the potential opportunities for restoration of existing Wetlands within the Proposed Designation. Based on the impacts of the Indicative Alignment, Wetlands 12 and 13 may provide the best opportunity for restoration of the wider Wetland 13 site at the ratios proposed by Dr Leigh Bull, NZTA's avifauna expert. For Wetland 24 (or any of the other higher value wetlands if impacted by the final alignment), restoration would best be undertaken through restoration of existing feature/s in the catchment/s affected (resulting in numerous high value Wetlands in the Proposed Designation (or broader catchment if addressed through the compensation mechanism) using the ratios proposed).

67 Fifthly, in section 5.4.3 of the Freshwater Assessment, I briefly describe what the design aspects for wetland creation / enhancement might be, including design requirements for vegetation, hydrology and buffers. These have been reflected in NZTA's resource consent conditions, which outline the specifications for Wetland offsetting (through either restoration or creation). I note that these have included specific requirements to provide avifauna habitat, as recommended by Dr Bull to ensure appropriate Wetland offsets can be achieved (including an appropriate set back from the road).

Overall effects on wetland ecology

68 Because of the poor condition of most of the remnant NPS-FM defined Wetland features in the Project area, Wetland effects are small. Following application of NZTA's Wetland effects management measures, including offsetting for moderate and high value Wetlands affected, I consider that the overall effects of the Project on wetland representativeness, ecosystem health, indigenous biodiversity and hydrological functions will be at least neutral and potentially positive. I consider there to be a potentially positive aspect because of the anticipated increase in value from Wetland offsets, particularly given their rarity in some catchments. But also because of the other effects management measures that will be provided to mitigate other ecological and landscape effects. In my view, offsetting is more likely than not to achieve a net ecological gain, through enhancement and protection, for Wetland indigenous biodiversity and Wetland function in this landscape..

PART B – SUMMARY OF MY ORIGINAL ASSESSMENT – STREAMS

69 This section will summarise my assessment methodology for streams (including identifying and classifying their respective values) and my assessment of effects on these as part of my Freshwater Assessment.

Assessment methodology – streams

70 My approach to classifying streams and evaluating their value is outlined in sections 2.2 of the Freshwater Assessment.

71 I used a combination of desktop review, field survey and expert interpretation to classify and assign value to streams. Initially, I undertook a desktop review drawing on a range of existing information sources (including Northland Regional Council's Indigenous Biodiversity Ranking and condition ranking, REC stream layers, State of the Environment monitoring, fish records, water quality information, Land, Air, Water Aotearoa data, eDNA information and other regional ecological datasets and literature).[26] I then undertook field investigations (or oversaw field assessments undertaken by WSP freshwater ecologists) at stream sites intersecting the Indicative Alignment (including walkovers, Stream Ecological Valuation (*SEV*) data collection, rapid habitat assessment (*RHAB*) scoring, and eDNA sampling during October and November 2025).[27]

72 Through those investigations, stream form and habitat characteristics (such as flow type, wetted width and depth, velocity, substrate, habitat form, riparian condition, instream organic matter, downstream connectivity, upstream extent and condition, and eDNA-based assemblage information) were recorded for each stream assessed.[28] I also classified each stream as ephemeral, intermittent or perennial (noting ephemeral flow paths were excluded from further the assessment because I considered them to be terrestrial drainage features without relevant aquatic habitat).[29]

73 I then compared the physical habitat and species-related metrics collected against accepted or inferred condition ranges and applied expert judgement to arrive at an overall ecological value and effects assessment.

74 In particular, I used RHAB and SEV to assess habitat condition and functional quality, while using eDNA data to identify fish and macroinvertebrate assemblages and to inform indices such as

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[26] Freshwater Assessment, section 2.2.3 at pages 6-7 and section 2.2.4 at pages 9-10.

[27] Freshwater Assessment, section 2.2.4 at page 9.

[28] Freshwater Assessment, section 2.2.4 at page 10.

[29] Freshwater Assessment, section 2.2.4 at page 9.

Macroinvertebrate Community Index and fish Index Biotic Integrity.[30] I note, however, that the faunal dataset is not based on repeated detailed fish surveys, conventional macroinvertebrate sampling or targeted fish trapping, but instead on two replicate eDNA samples at each SEV site, supplemented by regional monitoring information, published water quality information, observed stream condition, stream flow classification and the degree of catchment modification.[31] I consider this approach to be appropriate because it brings together the quintessential data on channel form, flow, condition and indicative assemblages. While the assessment is driven by habitat condition and eDNA samplings (which I acknowledge has some limitations), it does indicate the abundant fish and invertebrates present and so provides sufficient details of habitat, condition detail and likely faunal presence on which to make good judgements about the value of impacted streams.

75 It is true that very low abundances of rarer species may be missed using this approach, but not large populations of those taxa. The presence of one or a few rare (At Risk) taxa (such as longfin eel) does not make a significant difference to the values assessment, as that assessment is a compilation of the relevant factors and an averaged "score".

76 I further note that the assessment of effects on streams was less complex, as most of the affected stream reaches are in upper tributary headwaters within forestry or farming landscapes (where stream size, flow, and the extent and quality of fish habitat are generally limited).[32]

77 In my assessment of streams, I considered both stream condition and stream ecological value as related but distinct matters. By condition, I mean ecosystem health and the degree of physical and functional modification of the stream habitat. By value, I mean matters such as representativeness, rarity/distinctiveness, diversity, ecological context, integrity and resilience.[33] I assigned stream values broadly in accordance with the EIANZ guidelines, using a scale from negligible to very high, based on an overall judgement across those parameters rather than any single metric or species record alone.[34] In applying that framework, I considered stream condition to be particularly important in this Project area because the affected catchments have a long history of land use and modification, and the health of the stream habitat is a key

30 Freshwater Assessment, section 2.2.2 at page 5, section 2.2.3 at pages 7-8 and section 2.2.4 at pages 9-10.

31 Freshwater Assessment, section 2.2.3 at pages 7-8.

32 Freshwater Assessment, section 2.2.1 at page 4, section 2.2.4 at pages 9-10.

33 Freshwater Assessment, section 2.2.1 at page 5.

34 Freshwater Assessment, section 2.2.2 at pages 5-6.

determinant of whether ecological values are likely to persist over time.[35]

78 In assessing effects on streams, I first identified the appropriate scale for the assessment and the stream resource against which effects should be measured. In my opinion, the appropriate ecological scale for assessing stream effects is generally the catchment, rather than individual reaches or isolated sites, because a river system is a connected linear habitat and the health and condition of any one part of it is linked to the wider catchment.[36]

Classification of streams and their respective values

79 The Project spans four catchments, Pukekaroro, Wairau, Waihoihoi and Ahuroa (see Figure 1 reproduced from my assessment outlined below). I determined the amount of perennial and intermittent stream length within each of the four affected catchments to form the resource base for assessment (excluding ephemeral streams, as noted above).[37]

[35] Freshwater Assessment, section 2.2.1 at page 4-5.

[36] Freshwater Assessment, section 2.3.1 at page 15. The exception to that general approach is where there is a feature of particular special condition, value or size that makes the catchment scale too unresponsive. However generally, the catchment scale is the appropriate scale.

[37] Freshwater Assessment, section 2.3.2 at page 16.

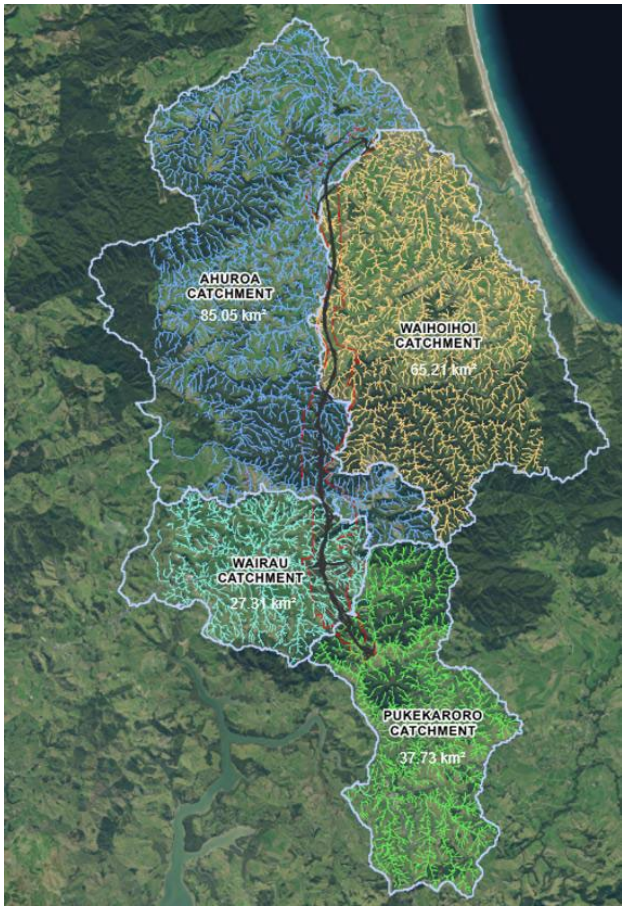

Figure 1 – Pukekaroro, Wairau, Waihoihoi and Ahuroa catchments

80 I focused my assessment on streams that would be impacted by the Indicative Alignment, including:

80.1 four streams in the Ahuroa Catchment (referred to as Pine North, Pine Mid, Piroa Main Stem and Piroa Tributary);

80.2 four streams in the Waihoihoi catchment (referred to as the Waihoihoi Main Stem, Waipū north, Waipū South and Roberson's Stream);

80.3 one tributary stream in the Pukekaroro (referred to as the Pukekaroro tributary; and

80.4 three in the Wairau catchment (referred to as the Mayflower North, Mayflower Main Stem and Wairau North).

81 I consider these to be an appropriate representative sample of streams for the purposes of my assessment as they capture the upper reaches of all streams that could be impacted by the final alignment. While I acknowledge that some tributaries (mostly intermittent) up stream of these areas were not surveyed (mostly located in the Waipū South headwaters, Pine North and mid upper tributaries and Wairau north upper tributaries), I consider that these tributaries, if surveyed, would have similar results to the information

collected from the lower, more perennial reaches of these streams (as they are on the same waterways just smaller with less flows and in the same land uses).

82 Table 10 and 11 of the Freshwater Assessment summarise the metrics recorded for each of the different streams, and my opinion as to their respective values (summarised in Table 4 below). In essence, most streams are of moderate value (despite reflecting poor physical condition, sedimentation and generally low faunal indicators). This is because, despite their condition (typically poor), they represent the typical instream assemblages, often support longfin eel, and generally exhibit the diversity and pattern given the typical degraded nature of the local waterways. The EIANZ process (and the NPS-FM) considers, to a degree, the context, rather than applying a simple national gradient of from poor to high value.

Table 4 – Values of streams assessed within the Proposed Designation

Value	Streams	Main factor contributing to values
High value	Waihoihoi Main Stem, Piroa Tributary West	Large river near coast or extensive native vegetation, contextually important
Moderate	Waipū South, Pine North, Pine Mid, Piroa Main Stem, Mayflower Main Stem, Pukekaroro Tributary	Generally forested with some form of tree cover, less farming impacts, moderate faunal indications
Low or Negligible	Wairau North, Mayflower North, Waipū North, Robertson's Stream	High farm influences, grass cover, modifications, low faunal indication

Assessment of effects on streams

83 The potential effects of the Project are outlined in Section 4.2 of the Freshwater Assessment. By way of summary the potential effects are:

83.1 During construction, reductions in stream habitat quality and extent (where streams are reclaimed, culverted or realigned), stream reduction or loss arising from groundwater changes associated with earthworks, contaminant discharges (including sediment, concrete and fuels), temporary disturbance of stream beds and fish migration pathways, fish mortality associated with in-stream works and aquatic biosecurity risks;[38] and

[38] Freshwater Assessment, section 4.1 at page 36.

83.2 During operation, stormwater runoff and hydrology, lighting and interruption of fish passage and associated habitat fragmentation.[39]

84 The key effects I address in my evidence relate to loss of stream habitat from realignment and a change or loss of habitat condition related to culverting, as well as potential interruption of fish passage (discussed separately below).

85 As outlined in my Freshwater Assessment, I have assumed a range of standard processes and managements of the common typical activities of building a road that can, but now rarely, generate effects such as sediment discharge, culvert installation processes, oil spills, fuel spills, temporary stream crossing protocols, fish salvage protocols, aquatic biosecurity protocols, lighting, and riprap armouring.[40] These actions are now governed by typical consent conditions and well-formed managements such that those effects are avoided or minimised to the extent possible.

86 In particular, and of largest potential effect to waterways (other than habitat removal), is earthworks generated sediment discharges. That process is managed by specific erosion and sediment control plans and processes. Mr Graeme Ridley, NZTA's construction-water expert, provides considerable detail on those processes and related risks. I am very confident in his experience and abilities in this space. From my review of his reporting, I consider that NZTA's proposed mitigation measures package will appropriately manage erosion and sediment control related effects during construction.[41]

87 As I record in my Freshwater Assessment, the receiving environments for sediment discharges, where they occur in higher rainfall periods that overwhelm controls, or where control mistakes are made, are not sediment sensitive environments, but rather they are long-adapted farmed streams with substantial bed sediments and adapted fauna. I am very experienced in measuring, monitoring and assessing sediment impacts on aquatic systems, having done so for both Transmission Gully and Mackays to Pekapeka. Whereas literature often quoted as evidence of sediment effect often has caveats related to effects on undamaged streams or hypothetic situations not on the reality of builds in modified stream environments. I know from experience (and other experience such as pine harvest sediment-generated effects) that minor and temporary discharges have no measurable adverse effects on fish

[39] Freshwater Assessment, section 4.1 at page 36.

[40] With regard to riprap, the caveat is that in steep landscapes erosion protection may drive large boulder long riprap sections which result in little surface flow. This typically occurs where riprap is >10m length and of a large sized material, such that flow under normal circumstances is greatly reduced or absent. In those sections, I consider that such culverting should be treated as stream loss with no habitat replacement, and added to the stream offset quanta.

[41] Freshwater Assessment, section 4.2.9, page 45.

and macroinvertebrates of adapted communities, and even larger scale discharges are recovered from in such environments relatively quickly. I perceive the risk of significant damage or community change as remote.

Loss of stream habitat

88 Table 12 of the Freshwater Assessment shows the extent (linear length) of each stream that is affected by the Indicative Alignment and spoil site depositions and the proportion of the catchment's waterway that effect represents (but does not include potential draw down effects, discussed later). **Table 5** below summarises those quanta.

Table 5 – Stream length affected by Indicative Alignment			**Proportion of catchment**
Catchments	**Length affected (~km)**	**In catchment (km)**	
Ahuroa (Pine North, Pine Mid, Piroa Main Stem, Piroa Western tributary)	3.1	340	0.9%
Waihoihoi (Robertsons Stream, Waipū North and Waipū South and the Waihoihoi Main Stem	2.7	264	1.0%
Wairau (Mayflower North and Main Stem, Wairau North and South and tributaries)	4.0	111	3.6%
Pukekaroro (Tributary)	1	158	0.6%

89 Having determined the values of the affected streams,[42] I then assessed the magnitude of effects on those streams by considering the linear extent of affected streams within the zone of influence against the total linear length of streams of the relevant type within the affected catchment.[43]

90 Prior to any consideration of effects management, other than the Wairau south tributary (not surveyed for eDNA and SEV), the proportional effect of the Project to the catchment (singularly) is less than 1% of the potential aquatic habitat available. Accumulatively the effect is <1% in the Ahuroa and Pukekaroro catchments and <4% in the Wairau and Waihoihoi.

[42] Freshwater assessment, Table 11 at page 34.

[43] Freshwater Assessment, section 2.3.5 at page 16.

91 The magnitude was tested at the catchment scale with some refinement for the Piroa West tributary (i.e. the catchment extent was reduced to reflect the extent of streams that traverse native forest areas). This scale reflects the scale at which the values assessment was undertaken , noting that rarity is determined on a regional and national basis, representativeness is a regional basis and most other aspects, such as context, is a catchment-based consideration (e.g. fish migration etc).

92 Generally, pre-effects management, the value and magnitude resulted in a negligible magnitude of effect at the stream level. For the Wairau south tributary, this resulted in a low level of effect (impacted by spoil deposition). On an accumulative basis, this resulted in a low level of effects for the Waihoihoi and Wairau catchments.

93 Where values are moderate or even high (i.e. Pine North, Pine Mid, Piroa West, Piroa Main Stem, Waihoihoi Main Stem, Waipū South, Mayflower Main Stem, Pukekaroro tributary), the negligible magnitude results[44] in a very low level of effect (i.e. less than minor). Even if the magnitude was low (based on some smaller scale than the catchment), I consider that the effects would still be low (minor).

94 In terms of the extent of impact in each catchment, Table 6 summarises the lengths of stream under either road or deposition site (but see Table 15 of the Freshwater Assessment[45]) and the amount of that impact that is remedied through culvert installation and realignments of the streams (discussed further in the mitigation section below).

Table 6 – Extent of impact, culverting and realignment

Catchments (Streams)	Stream impact (m)	Culvert extent (m)	Realignment extent (m)	Extent of reclamation (m)
Ahuroa (Pine North, Pine Mid, Piroa Main Stem, Piroa Western Tributary)	3110	1405	1010	1095
Waihoihoi (Robertsons Stream, Waipū North and Waipū South and the Waihoihoi Main Stem	2688	440	2190	58

[44] Noting a low magnitude of effect for the Pukekaroro tributary.

[45] Freshwater Assessment, Table 15 at page 40.

Table 6 – Extent of impact, culverting and realignment				
Catchments (Streams)	**Stream impact (m)**	**Culvert extent (m)**	**Realignment extent (m)**	**Extent of reclamation (m)**
Wairau (Mayflower north and Main Stem, Wairau North and South and tributaries)	4000	1002	3340	-342
Pukekaroro (Tributary)	1003	530	400	73
	10801	3377	6940	884

95 When the length of culverting and realignments are also factored into the equation, there is very little length of aquatic habitat actually lost (~884 (noting an additional 400m has been included for the Pine North tributary compared to the Freshwater Assessment, which I have been informed will not be able to achieve the design specifications to provide functioning habitat)). This conclusion relies on the fact that culverts do form aquatic habitat,[46] subject to incorporation of appropriate in-culvert velocities and substrates, albeit somewhat reduced in quality compared to the open stream.[47]

96 Therefore, the majority of the adverse effect is remedied through either culverts with habitat mitigations or new stream realignment habitat (either mimicking or providing better habitat than the stream that was replaced).

97 In my opinion, the level of stream effect (loss) prior to effects management (i.e. culverting and realignment) is minor or less, both for each individual area of stream affected and on an accumulated basis in each catchment. Generally, I do not consider these effects warrant offsetting (assuming the Waihoihoi is not culverted, and if it is realigned, and realignment mimics the existing size, length and condition). While I acknowledge the NPS-FM's directive to Councils to avoid, if practicable, the loss of stream extent and value, as with Wetlands, offsets are only required to address residual effects that are more than minor. With the mitigations proposed (including provision of culvert habitat through substrate and velocity regulation, and stream realignments mimicking (at least) the replaced stream), I consider that the effects on stream habitat are

46 Freshwater Assessment, section 4.2.5 at pages 41-42.

47 Studies showing in culvert habitat include: James. 2020. Freshwater Ecology of Piped Streams in Wellington: Pilot Study Final Report; Neale, Moffett. 2016. Re-engineering buried urban streams: Daylighting results in rapid changes in stream invertebrate communities; Hintz et al. 2022. Urban buried streams: Abrupt transitions in habitat and biodiversity.

less than minor. Nevertheless, effects management measures are proposed (discussed further below).

Impacts on fish passage

98 I do not consider that fish passage is expressly required at most of the proposed culvert locations because of their position in the stream system. Many of the Project's freshwater effects are in the headwaters, often within several 100m of the top of a stream, and in areas with limited fish species present (as indicated by the general fish data base results and the eDNA samples).[48]

99 Several tests, based on stream depth and size (from SEV data), flow potential fish species (eDNA) and the Auckland Regional Council's fish passage algorithm, were used to assess the need for passage. Despite limited up stream habitat availability and quality, and passage barriers downstream, this assessment indicated that fish passage should be required in certain streams (including the Piroa Main Stem, Mayflower Main Stem, Wairau North Main Stem and Pine North tributary). That passage is facilitated by the low gradient, larger culvert sizing (regulating velocities), installation and development of in culvert bed substrates.

100 I acknowledge that as design continues to progress that fish passage, and also in culvert retention of substrates and the formation of aquatic benthic habitat in culverts, cannot practicably be achieved in all locations. Of note, in the Pine North tributary, there is a need now for a 400m long, high gradient culvert to pass the road. Given the length and steepness of this culvert, regardless of the attempt to provide passage and retain substrate, it is unlikely to meet the design specifications required to provide suitable fish passage and habitat replacement. While 400m of stream in this catchment remains a less than minor habitat loss, it is no longer a retention of habitat.

101 I note that Pine North is one of the few stream crossing points in the Project that has a reasonable extent of stream habitat above it. There is around 2,500m of intermittent and perennial stream up four branches with fish habitat (to a degree). Thus, I recommend that if the Pine North tributary is culverted without provision for fish passage and appropriate habitat replacement, the loss of stream habitat effect must be offset (in the same way as any reclaimed extent of stream would be that are not replaced by culverts and realignments, discussed below).

102 However, in regard to the absence of fish passage, I do not recommend additional offset for the extent of habitat that remains upstream of the culvert that may no longer receive upward migrating juvenile fish. I consider the fish population in that

[48] Accepting the limitations of a 2-sample one-time eDNA survey, I note that potential impacts on fish passage will be addressed during implementation of the Project through the requirement for a Suitably Qualified Person to determine whether fish passage is required for certain culverts.

remnant habitat is likely limited to a small population of eel given the steepness and smoothness of the bed and which is only irregularly rejuvenated by successful upward migrants. The culvert ironically ultimately might improve macroinvertebrate and even frog populations in the absence of eel predation.

103 I cannot see another example of this topographic difficulty within the Proposed Designation such that if the road alignment was to materially change my assessment would be different and a similar situation as at Pine North would occur, other than the Waihoihoi Main Stem. However, I remain firm that either a bridge or a full and proper realignment of the Waihoihoi Main Stem are the only appropriate options if this stream is affected.

Conclusions in Freshwater Assessment

104 Overall, the Project's potential adverse effects on the extent and value of aquatic habitat in each stream (and even across each catchment) are minor or less than minor before any mitigations or remedial actions. This outcome is, by and large, because values are low to moderate in a highly modified landscape with ongoing water quality issues and poor stream conditions (with a few notable exceptions, as outlined above). And because the extent of the Project's effect in each catchment is small and generally near the headwaters of each catchment where flow is small and habitat limited.

STREAM MITIGATION PACKAGE

105 This section addresses NZTA's proposed mitigation package for the Project's potential effects on streams, including changes post-lodgement of the Application.

106 As for Wetlands above, I note that to address effects on streams, the effects management hierarchy in the NPS-FM requires the sequential application of avoidance, minimisation and remediation where practicable, and where more than minor residual adverse effects remain, offsetting and then compensation where possible.[49]

107 In terms of habitat loss and impacts on fish passage, such a long, linear landscape Project cannot avoid streams, there is no complete avoidance. The effects on streams, such as they are, I understand have been minimised as far as is practicable under the current Indicative Alignment. And if the scale of the final design is the same as the Indicative Alignment, then the level of effect to the same freshwater values will occur whatever the alignment within the designation, and effects minimisation will be about spoil site location and size.

108 Following avoidance and minimisation, remedial actions are then considered. For culverts, I have detailed what I consider to be

[49] NPS-FM at cls 3.21 and 3.22.

reasonable remedial actions through provision of inculvert substrates and velocities (an approach akin to the stream simulation process advocated for in the NIWA freshwater fish passage guidance).[50] That culvert installation and development process will assist provision of fish[51] passage and in pipe habitat for macroinvertebrates, reducing impacts on habitat quality that occur when a stream is culverted.

109 Project realignments will be undertaken to replicate the condition of the streams reclaimed, thereby replicating their values and their lengths. Those realignments are the remedy for the reclaimed stream sections.

110 I acknowledge there are some risks involved with both proposed remedial actions. However, to the extent those risks are realised, these will be addressed through NZTA's proposed offsetting requirements, where realignments or culverts fail to achieve the design specifications in the conditions (discussed below).

111 Thus, I consider that avoidance, minimisation, remedial and offsetting actions have been considered and adopted.

NZTA's proposed stream mitigation package

112 NZTA's proposed stream effects management measures are outlined in NZTA's resource consent conditions. By way of summary, this requires:

112.1 Measures for managing effects of temporary bridges and culverts during construction (including reinstatement of channels and provision of fish passage);

112.2 Fish salvage and transfer by a Suitably Qualified Person prior to any dewatering or diversion of streams;

112.3 Measures for managing effects of freshwater pests and construction related discharges, including measures to manage concrete leachate, storage of fuels, lubricants, hazardous and / or dangerous materials to avoid discharges and operation of machinery to avoid spillages of fuel, oil and similar contaminants;

112.4 Robust erosion and sediment control requirements;

112.5 Restrictions on culverting of the Waihoihoi stream (by requiring this to be bridged or realigned in accordance with specific design requirements). I consider that this is necessary as the Waihoihoi is a migratory system, and

[50] NIWA. New Zealand Fish Passage Guidance Version 2.0. June 2024.

[51] And in places, potentially kiwi passage as addressed in Dr Bull's evidence.

therefore facilitates fish passage within the broader catchment;

112.6 For any loss of stream (both perennial and intermittent) that are not realigned or culverted (including the culvert of Pine North tributary) in accordance with the requirements of the conditions, offsetting through riparian works (i.e. planting and fencing to satisfy specific criteria). The length of riparian works must be determined by calculating what length of riparian works would be required to provide an equivalent uplift in value for what was lost (considering the value of existing streams lost against the value of stream where offsetting is proposed to occur). I note that this calculation has been developed using a modified version of the SEV-ECR, without provision for potential value or a multiplier for failure and time lag (discussed further in response to comments below). In addition, I note that NZTA is now also proposing that for perennial and intermittent streams on the southern side of Brynderwyn Hills (north of the Piroa) that are impacted by spoil a multiplier greater than 1 be applied (1.5) for any offsetting, which I understand is to incentivise a contractor to minimise such effects through detailed design. I am not opposed to such an idea. Clearly this increases the amount of good (habitat improvement) that is then related to the loss.

112.7 Stream realignment design requirements to ensure the replacement streams mimic the quantity and quality of the original stream before realignment.

112.8 In relation to permanent culverts, requirements for:

(a) provision of fish passage in permanent culverts where determined necessary by a Suitably Qualified Person and practicable to do so; and

(b) design specifications to provide in-pipe habitat and fish passage where this is required, and specific gradient, velocities and in pipe substrates that seeks to minimise the habitat condition loss (by remedying any reduction in value).

113 I offer the following additional commentary in relation to NZTA's proposed mitigation package.

114 As discussed above, fish passage will only be required for certain culverted streams. Where the culvert cannot perform benthic habitat condition (and so also fish passage), the affected stream length will be offset (including the Pine North tributary, given the moderate value habitat).

The outcome of failure to create fish passage and associated habitat in these streams would only be a small diminishment in each catchment's headwater streams fish numbers over time (which currently are low-flow small habitats with few fish resources and qualities). I assess such an effect to be a less than minor effect (given the low value of the feature and low magnitude of impact). I further note that macroinvertebrate communities will benefit from reduced fish presence. Consequently, while absence of passage should not be a target, the outcome of failure to achieve fish passage is not a significant adverse effect.

Overall conclusion on stream ecology

115 Given the value and extent of streams that are affected and the magnitude of those effects, I consider that NZTA's mitigation package will result in a less than minor effect overall and Project-wide I consider it is more likely than not that there will be a general uplift in stream quality across much of the designation once all the various remedies and offsets are in place.

116 In my opinion, the proposed realignment approach is a responsible approach in regard to the NPS-FM directives and will result in a neutral or even slightly positive outcome for stream values and conditions in the four catchments. This outcome arises because the realignments are likely, through the design requirements in NZTA's conditions, to be better habitat than that which they replace.

117 I also consider that NZTA's conditions for managing stream effects will ensure that mitigations, and any offsets, will be effective wherever the road alignment and design ultimately settle.

PART C – RESPONSE TO COMMENTS – WETLANDS

118 In this section, I will respond to comments from DOC, Te Parawhau, Te Uri o Hau and Patuharakeke on Wetlands. In particular:

118.1 Identification of Wetlands and associated extent;

118.2 Classification of Wetland value; and

118.3 NZTA's mitigation package.

Identification of Wetlands and associated extent

119 In its comments, DOC has identified 4.88 hectares of Wetland habitat and 3.32 hectares of 'likely' Wetland habitat that it considers should have been included in my assessment.[52] These Wetlands were identified following lodgement, and I have reflected them in my updated identification and classification of Wetland extent and

[52] Comments from the Department of Conservation on behalf of the Director-General of Conservation (*DOC Comments*) at Appendix B – Vegetation, pages 51-66 at paragraphs 172-229.

values in Tables 2 and 3 above (including increases to the extent of Wetlands identified in the Freshwater Assessment).

120 Having not had the opportunity to undertake a specific assessment of values for these Wetlands myself, I have adopted DOC's classification of values and reflected these in Tables 2 and 3 above (noting that their classification of Wetlands as 'low' value is likely more akin to what I consider to be negligible value).[53] These additional Wetlands are largely located on properties I did not have access to when preparing my Freshwater Assessment, and were not clear in google aerial imagery. I note that Wetlands 34-37 have not been accessible by myself or DOC.

121 I note now that Mr Singers has also evaluated these areas (some from site visitation, noting he could not get access to Wetlands 34-38 but used binocular observation). He has agreed that the features which I have assessed as of low or less value are of low or less value.

122 Considering these additional Wetlands, there is a small increase in the amount of moderate-high value Wetland affected, and some Wetlands of unknown (but likely low) value. I consider that the updated mitigation package will appropriately respond to effects on these features, as the pre-construction survey requirement outlined above will confirm the extent and values of any unknown, moderate or high value Wetlands not currently reflected in the Freshwater Assessment, and any necessary offsets.

123 I consider this approach to be appropriate, as it will ensure that offsetting is based on the values of Wetlands at the time they are actually affected. Specifically, this approach will ensure the effects management measures respond to changes in ecological value that may change in time (whether increases in ecological value from restoration efforts, or reductions in value through direct removal or drainage within a largely unprotected farm landscape).

Classification of Wetland value

124 In its comments, DOC has made various statements about my approach to classifying Wetland value. In particular:

124.1 Consideration of Wetland fauna (including aquatic fauna);[54]

124.2 Classification of values for Wetlands identified in the Freshwater Assessment;[55] and

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[53] Specifically, Wetlands 26-39.

[54] DOC Comments at Appendix B – Vegetation, page 51 at paragraph 170- 171; Appendix A – Freshwater, pages 4-5 at paragraphs 10-14.

[55] DOC Comments at Appendix B – Vegetation, pages 51-60 at paragraphs 172-204.

124.3 Assigning value to the additional Wetlands identified in DOC's comments.[56]

124.4 Resurvey prior to construction.

125 While it is true that no detailed faunal surveys have been undertaken within the Proposed Designation, I do not consider these necessary to determine effects on Wetlands and associated mitigation measures, for the reasons outlined in Part A above. In summary, most Wetlands are predominantly exotic herbaceous features modified by existing farm activities, and poor quality habitat in such a modified environment is highly unlikely to contain important fauna (such as birds and black mudfish) or rare plant species, let alone stable viable populations that would change the value of these features.

126 I note that Wetlands 12 and 13 only have fern birds present because of the surrounding scrub/shrub/forest, not because of the herbaceous nature of the Wetlands themselves. For the moderate and high botanic / habitat value Wetlands, if such fauna were identified (which in the modified landscape would be highly unlikely), this would not change their already moderate or high value. Irrespective, I consider that NZTA's proposed mitigation package will ensure that effects on these features are appropriately addressed (through pre-construction surveys to determine if offsetting is required, including consideration of whether Wetlands provide habitat for cryptic marsh bird species, and specific offsetting requirements to replace such habitat).

127 The only caveat to that commentary relates to black mudfish. As noted in Part A above, although I consider their presence highly unlikely,[57] it cannot be ruled out in any Wetland which contains surface water and is either seasonally (or was once historically) connected to a river,[58] and without surveys there would be no cue to salvage them before works. I have therefore recommended (and NZTA has adopted) a requirement for pre-construction black mudfish surveys to determine whether any salvage should be undertaken before works that may impact Wetlands.

128 I do not consider there is any need to undertake these surveys now, as:

128.1 it would need to be repeated before the start of works; and

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[56] DOC Comments at Appendix B – Vegetation, pages 60-66 at paragraphs 206-229.

[57] Given the NIWA fish database's general absence of records in the 4 catchments involved, the poor connectivity and condition of the Wetlands present.

[58] At present, this would include Wetlands 2, the lower parts of Wetland 13 and Wetland 24.

128.2 any Wetlands where black mudfish are identified would be offset to reflect the values these may bring to the impacted Wetland.

129 In light of its commentary on the number and extent of Wetlands within the Proposed Designation, DOC has also questioned the value that I have assigned to different Wetlands and provided its own classification of values (both for those in the Freshwater Assessment and those identified as part of their comments).[59] While there are some differences between Wetlands identified by myself and those identified by DOC, they are not overly different (other than what I have determined as negligible, the DOC expert would likely consider as low). The difference may be a perception issue of rarity and future potential. Irrespective, this difference is immaterial to the outcomes of assessment of effects and recommended effects management measures.

130 DOC's key criticism in relation to surveys is that they need to be undertaken now to influence the design process going forward. However, the moderate and high value Wetlands (which as I understand it are agreed) are known and mapped and those can even now be considered through the design moving forward. It therefore falls to, if additional surveys would raise any of the low value Wetlands to moderate or higher. I strongly suggest that it will not for the reasons outlined above. Even if, on the outside chance, a Wetland feature did increase in value, then that would trigger the requirement for offsetting. However, I remain of the opinion that the risk of finding an additional Wetland of a value that requires offsetting is less than remote.

NZTA's mitigation package for Wetlands

131 DOC has suggested amendments to NZTA's current Wetland mitigation package. In particular, changes to the scope of Wetlands that should be offset, the proposed offsetting locations, offsetting ratios and ongoing monitoring and protection requirements.

Offsetting extent

132 DOC has suggested that all Wetlands within the Proposed Designation should be offset if they are affected by the Project (rather than just those that will experience a more than minor level of effect or are of moderate or higher value).[60] As outlined above, I fundamentally disagree with this conclusion. The level of effects on negligible and low value Wetlands will be no more than minor prior to mitigation and would not offer meaningful ecological benefits if

[59] DOC Comments at Appendix B – Vegetation, pages 57-60 and 60-66 at paragraphs 201-204 and 205-229.

[60] DOC Comments at Appendix B – Vegetation, pages 71-74 at paragraphs 252-263; Appendix G – Terrestrial and wetland offsetting, pages 11-13 and 17 at paragraphs 39-45 and 70.

subject to an equivalent replacement. Therefore, I do not consider any effects management measures are necessary.

Offsetting locations

133 DOC does not consider that the potential Wetland offsetting locations I identified in the Freshwater Assessment are appropriate.[61] Specifically, areas at the southwest corner of the intersection of State Highway (*SH*) 1 and SH 12, and at Wetland Q08/066.[62] DOC has suggested considering alternative restoration opportunities for existing degraded Wetlands within the Proposed Designation.[63]

134 As recorded above, I am in favour of restoring existing negligible/low value Wetlands as a way of offsetting (including Wetland 13, lower Wetland 12, Wetland 25 and Wetland 39). However, I remain of the opinion that Q08/066 is a very suitable location for offsetting. Wetland Q08/066 offers considerable benefits for avian fauna as this is a location with a large stable water body. While the drier arms of this feature have been enhanced already, the wider water body edges, downstream and the water body itself have not. Therefore, I consider that this Wetland offers an excellent candidate for enhancement (through extensive raupō plantings and sedgeland edges).

135 I am less confident of the feature in the corner between SH 1 and SH 12, where considerable work would be required to assure good hydrology and removal of substantive existing wetland trees.

136 Irrespective, I note that there are many other suitable areas for offsetting purposes (including Wetlands 12, 13 and 39). I do not consider that the offset location needs to be identified and locked in now as a condition.

Offsetting ratios

137 DOC has suggested that different offsetting quantities should be applied to address the loss of Wetlands. In particular:[64]

> *If the offset wetland is restored within five years after the impact: apply a 1:2 ratio for low-value wetlands; a 1:3 ratio for moderate-value wetlands, and a 1:4 ratio for high-value wetlands.*

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61 DOC Comments at Appendix B – Vegetation, pages 71-74 at paragraphs 252-263; Appendix G – Terrestrial and wetland offsetting, pages 13 and 17 at paragraphs 46-47 and 72-74.

62 Freshwater Assessment, section 5.4.3 at pages 55-57.

63 DOC Comments at Appendix B – Vegetation, pages 71 and 74 at paragraphs 252--263.

64 DOC Comments at Appendix G - Terrestrial and wetland offsetting, page 17, paragraphs 71-72.

If the offset wetland is restored within one year after the impact: apply a 1:1.5 ratio for low-value wetlands; a 1:2.5 ratio for moderate-value wetlands, and a 1:3.5 ratio for high-value wetlands.

If the offset wetland is restored more than three years before the impact: apply a 1:1 ratio for low-value wetlands; a 1:2 ratio for moderate-value wetlands, and a 1:3 ratio for high-value wetlands.

138 I consider context is important when determining the appropriate ratios for offsetting purposes. While the ratios DOC has sought have been used in other contexts, I consider mine are more appropriate for this Project. The issue to my mind is that while the Wetlands of moderate and high value are better quality than the majority of other Wetlands within the Proposed Designation, they are still highly modified, with low complexity and diversity. Given these factors, I do not consider they warrant the higher offset ratios DOC has sought. I note Mr Nicholas Singers' commentary about the ratios developed for similar Wetland types in the recently consented Cambridge to Piarere NZTA project. In that context, his Biodiversity Offsets Accounting Modelling demonstrated simple, partial native wetlands (native exotic mosaics) were calculated to have 1:3.4 where loss and creation occur at the same time and 1:1 where the offset is created 5 years in advance of the loss. I consider this outcome supports the ratios I have recommended for this Project.

139 I note that NZTA has agreed to adopt DOC's offsetting ratios for Wetland restoration (as opposed to creation). Technically, I acknowledge that Wetland restoration rather than creation should attract higher ratios as undertaking improvements is not the same as developing new Wetland. It is similar for streams, where creation typically results in a lower ECR than stream riparian improvement, because SEV gain is much less in enhancement than for the formation of new habitat. However, it is my opinion that where wetland creation, not enhancement of existing features, is the final option then my suggested ratios are fair and proportionate.

Monitoring and long-term protection

140 DOC has sought revisions to the Wetland monitoring requirements in the conditions to include:[65]

140.1 all Wetland habitats within or adjacent to the footprint of works;

140.2 potential groundwater effects of embankments; and

140.3 detection of changes in groundwater levels (whether an increase or decrease).

[65] DOC Comments at Appendix B – Vegetation, pages 82-83 at paragraphs 306-308.

141 Hydrological draw down is not predicted by modelling everywhere within the Proposed Designation. It is isolated to areas in proximity to large cut areas, primarily the Pukekaroro ridge, Mayflower ridge, within the pine forest (pine mid) of the Brynderwyn Hills and the headwater area north of the hills near Waipū.

142 Given I do not consider any offsetting is necessary for negligible/low value wetlands, I do not consider these require monitoring for groundwater drawdown impacts. Of the moderate and high value Wetlands within range of potential modelled draw down, only Wetland Q08/066 may potentially be hydrologically affected (what will be left of lower Wetland 13 is well down stream and others are generally up stream and distant). I have proposed a monitoring regime for that Wetland, and understand NZTA will be proposing a condition requiring monitoring of moderate and high value Wetlands if these are modelled to experience groundwater drawdown and are not being offset, as noted above. This would be especially necessary where it also became an offset enhancement site.

143 DOC also considers that offset sites need to be legally protected in perpetuity.[66] I disagree, as once offsetting has been undertaken (meeting the requirements outlined in NZTA's proposed conditions) then the Wetland will be as it was before the Project. Specifically, these Wetlands will be fenced and otherwise protected by the rules and regulations in the relevant planning and policy documents (if any future impacts are proposed to occur). I further note that the effects on Wetlands will not be in perpetuity (because a high value Wetland will replace a currently affected one).

PART D – RESPONSE TO COMMENTS– FRESHWATER

144 In this section, I will respond to comments from DOC, Te Uri o Hau, Patuharakeke and Te Parawhau on streams. In particular:

144.1 Assessment methodology;

144.2 Identification of streams and classification of value; and

144.3 NZTA's mitigation package for streams.

Assessment methodology

145 I have reviewed the comments from DOC on my assessment methodology for assessing effects on streams.[67] I do not accept many of their comments (noting these matters have been the subject of debate in various previous consenting processes I have been involved in). In particular, I consider:

[66] DOC Comments at Appendix G - Terrestrial and wetland offsetting, page 13at paragraph 48.

[67] DOC Comments at Appendix A – Freshwater, pages 18-25 at paragraphs 43-65.

145.1 The use of a catchment scale to assess the magnitude of effect on streams is very appropriate;[68]

145.2 It was appropriate to exclude certain fish from values classifications where they were not represented in the data (eDNA and NIWA and Council SOE records) when considering rarity in certain modified, degraded streams;[69]

145.3 Cumulative effects on streams were adequately considered;[70]

145.4 Values data has not been under-represented; and[71]

145.5 The SEV, and more importantly the ECR, calculation NZTA proposes has been applied correctly. As outlined above, I do not consider that strict adherence to the SEV/ECR calculations is necessary. The SEV-ECR is just a tool, not a statutory requirement, and the method proposed in the condition is transparent with offsetting principles of the NPS-FM (i.e. the observer can see the applied math and the quanta used of which variables and the rationale).

146 However, there is one matter that DOC has raised that I consider warrants a response, relating to my approach to determining the magnitude of effects for streams.

147 As per the EIANZ guidelines, the magnitude of effect represents the degree of change or loss of individuals, features, areas, populations or ecosystems and lies on a gradient from negligible to very high. One must consider the contribution of the impacted individual, feature or area as a component of the wider population or ecosystem. That is, what would the implication be if this component was lost – would it be a high impact relative to the known population or ecosystem (considering the feature's particular area, type or habitat)? The scale of consideration when determining the magnitude of effect becomes very germane.

148 As outlined in Part B above, when undertaking my assessment I have always considered a scale that is appropriate to the relevant local ecology. Streams are a continuum: species that live within them traverse from the mouth to the headwaters and back again, and resources (coarse organic matter, fine organic matter inputs etc) are added and flow downstream through the (usually connected) system. It therefore makes ecological sense to consider the impacts on a stream within its catchment, as part of the broader ecosystem, and the appropriate scale for determining impacts on

[68] DOC Comments at Appendix A – Freshwater, pages 19-21 at paragraphs 48-53 and Appendix F – Freshwater offsetting, pages 7-8 at paragraphs 22-23.

[69] DOC Comments at Appendix A – Freshwater, pages 18-19 at paragraphs 43-48.

[70] DOC Comments at Appendix A – Freshwater, page 23 at paragraph 59.

[71] DOC Comments at Appendix A – Freshwater, pages 24-25 at paragraphs 61-65.

streams will most often be the catchment of the stream. I acknowledge that sometimes this scale will need to be refined if the affected feature has some unusual condition (for example, if the feature has native riparian cover where much of the streams (or a collective of those with the same stream order) in the catchment do not). However, it is very rare that an individual site or feature will be an appropriate scale to determine effects on streams.

149 In my assessment, considering the impacts against each system's catchment length of waterway, the loss is very small. As noted above, the catchment is the relevant scale at which to consider the effects on these typical modified and generally simplified aquatic systems.

150 Regardless of the effect level outcome, I note that NZTA's mitigation package will avoid effects on specific features (through restrictions on culverting the Waihoihoi), remedy the majority of effects (through realignments and culvert design), and require offsetting where realignments or culverts do not achieve the requisite design requirements to either replace habitat (for stream realignments) or provide habitat (for culverts).

151 The only substantive difference between DOC and NZTA's mitigation package is an absence of an offset for culverting (in addition to the provision of habitat through the existing culvert design requirements). In my opinion, except for the Pine North tributary, while each culvert location shows some decrease in value, with the in-pipe mitigations I have recommended, that reduction in value is minimised (see section 4.2.3 and Table 16 of the Freshwater Assessment). Therefore, the residual adverse effect at even a much smaller scale of assessment is still less than minor. I note that as part of NZTA's mitigation package, where the design specifications to provide habitat in culverts cannot be achieved, the requirement for offsetting will be triggered.

Identification of streams and classification of value

152 I have reviewed the comments from DOC on my assessment methodology for identifying and classifying values of streams.[72] I do not accept their comments. My assessment of effects is intended to inform the development of appropriate mitigation measures for the Project. I do not consider the development of mitigation measures requires extensive survey efforts, provided there is sufficient information in order to identify potential effects and recommended mitigation measures, including significant issues and ecological values that warrant specific effects management responses. That exercise relies on equal parts of my expert judgement based on the stream condition viewed, as well as the array of metrics attained in relation to those through the surveys undertaken.

[72] DOC Comments at Appendix A – Freshwater, pages 7-18 at paragraphs 19-42.

153 It would take considerable time and cost to survey the full extent of all streams within the Proposed Designation to a level that could confidently state which species were and are not present. Even if I had done so, I still could not be certain that all species in all locations were accounted for. Irrespective, I do not consider that identification of any additional species through further surveys would have led me to a conclusion that any additional streams within the Proposed Designation required alternative effects management measures to be implemented, other than those already proposed.

154 In my opinion, the assessment has been undertaken using an appropriate data set, enabling me to identify higher value habitats and understand the general value level of habitats within the Proposed Designation. The one example of a stream with values that warrant near avoidance is the Waihoihoi Main Stem. However, substantive sampling of many aspects was not required for me to arrive at that conclusion (through observation, ecological theory and my expert professional judgement). While the Waihoihoi Main Stem is not, in my opinion of such value in terms of condition that I would advise total avoidance, it is of such value due to its context that its treatment must be substantive (i.e. either bridging, or realigning to return a better habit outcome if the feature is not avoided).

155 Irrespective of the survey data relied on for my assessment, I note that there will be future surveys undertaken to inform the detailed design process and implementation of effects management measures for the Project. In particular, I note that fish salvage and transfer is required in all intermittent and perennial waterways, ensuring that any unsampled species present will be relocated prior to works.

NZTA's mitigation package for streams

156 DOC has suggested that amendments are necessary to NZTA's proposed stream mitigation package. I discuss each of these below.

Freshwater offsetting package

157 Some commenters have suggested that the current requirement for freshwater offsetting is inadequate. In particular:

157.1 that offsetting should be applied to adverse effects on all intermittent and perennial streams;[73] and

157.2 the Stream Ecological Valuation (*SEV*) and Ecological Compensation Ratio (*ECR*) from the SEV Technical Report should be strictly applied.[74]

[73] DOC Comments at Appendix F – Freshwater offsetting, pages 15-16 and 20 at paragraphs 41,-43 and 61(a).

[74] DOC Comments at Appendix F – Freshwater offsetting, pages 16-17 and 18-19 at paragraphs 45-48 and 52-63.

158 As outlined above, I consider that the effects on stream extents and values will be appropriately addressed by NZTA's proposed mitigation package. To the extent streams are not realigned (to replace the same or better aquatic habitat) or culverted (providing habitat within the pipe) in accordance with NZTA's conditions, offsetting will be required through riparian enhancement to address any more than minor residual effects for both perennial and intermittent streams.

159 Again, I note that the effect in most culverts is a relatively small departure from the current habitat value. That limited value is because low velocity culverts with substrate have habitat value. Therefore, I do not consider that these constitute stream loss, and therefore should not automatically be considered to require an offset. Furthermore, as outlined above the realignment of streams will replace aquatic habitat that has been lost, where appropriate design specifications are met (i.e. using the same water, in the same general location), this will remedy the flow and potential impacts on aquatic habitat. Both of these mitigations, if they fail, will be addressed by NZTA's proposed consent conditions.

160 I acknowledge that realignments at spoil sites are at risk of potential failure due to an inability to access ground water. However, this outcome would trigger the need to undertake offsetting, as noted above. Further, I note that NZTA's proposed conditions now disincentivise placement of spoil in higher value streams within the Proposed Designation through increased offsetting ratios. Accordingly, the likelihood of spoil placement in these locations will be reduced.

161 With regard to SEV and the calculation of the ECR, I note that topic has been the subject of extensive debate between myself and experts engaged by DOC over recent years (most recently on the Cambridge to Piarere Expressway project). I will not address the extensively here, but note that:

161.1 The SEV Technical Report[75] is a useful assessment tool, but it should not be applied mechanistically. In my view, the SEV methodology assists in quantifying stream ecological effects and informing an appropriate level of offsetting or compensation, but it is not a prescriptive rule. Its application requires expert judgement, having regard to the particular characteristics of the streams affected and the context of the Project.

161.2 It is not appropriate in this case to inflate the measured SEV of affected streams to a hypothetical 'potential' score. The 'strict' SEV/ECR approach assumes that affected streams

[75] Storey, R.G., Neale, M.W., Rowe, D.K., Collier, K.J., Hatton, C., Joy, M.K., Maxted, J.R., Moore, S., Parkyn, S.M., Phillips, N. and Quinn, J.M. (2011) Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland streams. Auckland Council Technical Report 2011/009

should be assessed by reference to the condition they might achieve under improved management. In my opinion, that is not realistic for this Project. I say this because of the evident condition of the existing current streams which show little evidence of landowner consideration for their betterment and because of the extent of management that would be required to achieve higher SEV outcomes, and in some places that gain is likely to only be small.

161.3 The streams should be assessed by reference to their actual current condition, rather than on the basis of an assumed future restoration scenario that may never occur in the absence of the Project.

161.4 The default 1.5 multiplier is not required in all cases and is not justified here. That multiplier was developed as a precautionary response to matters such as lag time, uncertainty, and the risk of failure to implement mitigation. In my experience, and based on the outcomes of comparable projects, those concerns do not invariably arise to the extent assumed in the original guidance. Stream realignments and associated mitigation can restore instream ecological values within a relatively short timeframe, with full riparian maturation occurring later. Accordingly, I do not consider it necessary here either to uplift the affected streams to a hypothetical potential SEV score or to apply the 1.5 multiplier. In my opinion, doing so would overstate the Project's ecological effects and produce an offsetting requirement that is disproportionate to the actual impacts of the works.

161.5 The appropriate ECR must ultimately be determined by expert judgement about the streams affected and the streams to be restored or enhanced. Consistent with the SEV guidance itself, I have used the SEV as a practical tool to inform that judgement.

162 Based on the condition and values of the streams affected by this Project, I consider NZTA's proposed mitigation approach provides an appropriate and proportionate basis for calculating freshwater offsetting requirements.

Proposed construction methodology

163 DOC and Patuharakeke have sought changes to NZTA's proposed construction methodology, including:

163.1 more prescriptive requirements for fish salvage and transfer through a management plan;[76] and

[76] DOC Comments at Appendix A – Freshwater, pages 33-28 at paragraphs 87-88, 91 and 92; Patuharakeke Te Iwi Trust Board Comments, Ecological Review of Fast Track Application FTAA-2603-1178 Alternative to Brynderwyn Hills Northland

163.2 measures for managing erosion and sediment-related effects on freshwater habitat and species.[77]

164 NZTA's proposed conditions require a Suitably Qualified Person to salvage and transfer fish to a suitable watercourse before works that may impact their habitat. Fish salvage and transfer is a standard exercise with a number of experienced practitioners, and aspects of the salvage/transfer typically covered in the usually required MPI permit. Any plan developed ahead of the construction process cannot cover all eventualities and a fixed plan can make it difficult on site when a salvage requires novel approaches or approaches not set out in the plan. I have had considerable experience of this issue on the Transmission Gully project, where on-site adaptation was made difficult because of rigid plans. Therefore, I do not consider a fish salvage and transfer management plan is necessary.

165 With respect to discharges, I consider NZTA's proposed erosion and sediment control measures are robust and will ensure these effects are appropriately managed (as outlined in Part B above). To the extent there are discharges to the receiving environment (for example, in heavy rainfall events that exceed the capacity of NZTA's erosion and sediment control devices), I note that in my experience, the predicted increase in sediment loads for the Project is low (especially compared to those for the Transmission Gully build).

166 As outlined in Part B above, any sediment discharged from the Project (single events, occurring accumulatively over the time of the earthworks) will be to highly modified, generally soft bottomed and sedimented streams whose communities are already adapted to such inputs.[78] This is consistent with my eight years of monitoring through the Transmission Gully build, where despite some discharges and raised suspended sediment levels, I did not identify any more than minor or temporary adverse effects on freshwater fauna. Acknowledging the Project's different geological context, I do not consider any additional effects management measures are required, beyond implementation of NZTA's erosion and sediment control measures, they are already industry best practice.

167 DOC has also suggested setting effects-based turbidity triggers using frameworks such as Earth Science New Zealand's 'Setting maximum turbidity levels for riverine fish'. I do not consider this necessary or appropriate for a Project of this scale in such modified farmland systems. That framework would set a 25 NTU trigger based on banded kōkopu, a relatively common species even in the high sediment yielding catchments downstream of the Project. By comparison, the Transmission Gully investigation trigger was 300

Corridor (Section 2B) (*Patuharakeke Ecology Comments)*, page 82, paragraphs 285-288. .

[77] DOC Comments at Appendix A – Freshwater, pages 26-27 and 34 at paragraphs 68-72 and 94.

[78] Freshwater Assessment, section 4.2.9 at pages 45-46.

NTU, which was exceeded numerous times each year, yet banded kōkopu, kōaro and giant kōkopu remained present downstream after seven years of construction.

168 Patuharakeke has also suggested that baseline ecological monitoring is necessary to inform the implementation of Erosion and Sediment Control measures.[79]

169 I support NZTA's proposed effects management measures that require monitoring of water quality as part of the Erosion and Sediment Control Plan requirements. However, in terms of broader ecological monitoring, in my opinion baseline surveys will be typically uninformative where the receiving environment is already well adapted to the potential effect, in this case sedimentation.

170 Measurement of pH, algae cover, water clarity, deposited sediment, water depths, water velocity, wetted channel width, and quarterly macroinvertebrate monitoring simply does not provide a cause-and-effect evidence base to support identification of a sedimentation effect. This is because of the natural variability of these modified streams over time which causes a highly variable or non-representative baseline measure and results in substantive complexity in identifying relevant and substantive change in those communities caused by sediment discharges. In these modified environments, only very large deposition events would have a measurable effect.

171 As recorded above, I have spent eight years biannually and trigger event monitoring sediment discharge issues and effects at Transmission Gully. Despite numerous small, and even some large discharges, there has been no recorded or proven adverse effects to the benthic macroinvertebrate communities or fish communities in the receiving environment. Accordingly, I do not think such monitoring is necessary.

Design requirements

172 DOC has made some specific commentary on the design requirements for culverts and realignments, including:

172.1 fish passage specifications;[80] and

172.2 planting of realignment riparian zones.[81]

173 The current design guidance in the conditions will by default ensure fish passage is provided where it is appropriate for it to occur. However, in some places as design progresses there may be situations where gradient in particular precludes substrate retention

[79] Patuharakeke Ecology Comments page 76.

[80] DOC Comments at Appendix A – Freshwater, pages 28-31 and 34-35 at paragraphs 74-82 and 98-100.

[81] DOC Comments at Appendix A – Freshwater, page 35 at paragraph 101.

and cause unacceptable velocities. Under such circumstances, the culvert is no longer a habitat replacement. NZTA's mitigation package would require offsetting for the loss of value as part of that stream through riparian enhancement works elsewhere.

174 With respect to planting of realignments, the remedial actions seek to mimic that which is affected. If the affected stream length has riparian vegetation, then so should the realignment. If not, then I do not consider riparian planting should be a requirement as it would not be necessary to attain equivalent instream conditions. To require all the realignments to be revegetated for some width would amount to a betterment (and require fencing also).

175 Patuharakeke has sought amendments to the conditions, requiring:[82]

175.1 Bridging of the Waihoihoi main stem, Piroa main stream, Mayflower main tributary, Wairau north tributary and Pine north main tributary; and

175.2 Restrictions on the extent of freshwater habitat removal, both streams and Wetlands.

176 With respect to bridging, only the Waihoihoi main stem has the values and contextual functions that I consider may warrant bridging from an ecological perspective. However, I do not think bridging is required, subject to implementation of a quality designed realignment. While bridges can be preferable ecologically, I do not consider they are necessary where mitigations can provide appropriate remedy or replacement of instream and riparian values.

177 Given the values and the condition of the greater extent of streams and wetlands affected, I do not see a need for a restriction on the extent of waterway or wetland affected by possible future designs. In my opinion, the mitigations and offsets required by NZTA's proposed mitigation package will ensure that any effects are appropriately managed, irrespective of the final extent of impact.

CONCLUSIONS

178 Having considered the comments received, my assessment remains that the Project's effects on freshwater ecology will be appropriately managed through NZTA's proposed mitigation package.

179 That is because the proposed conditions provide a suite of measures to avoid and minimise effects where practicable, to remedy effects through stream realignment, culvert design and construction management, and to provide offsetting or compensation where required.

[82] Patuharakeke Ecology Comments, sections 2.5, 2.12 and 4.3.

180 In relation to Wetlands, I remain of the view that low and negligible value wetlands in highly modified farmed landscapes do not require offsetting, but that moderate and high value wetlands that are affected will be appropriately addressed through the proposed pre-construction surveys, salvage requirements, and offsetting (or compensation) measures.

181 In relation to streams, I remain of the opinion that culverts and stream realignments can appropriately remedy or reduce effects where they are designed to retain habitat and provide for fish passage where required and practicable. Where that cannot be achieved, NZTA's proposed conditions require offsetting.

182 Overall, I consider NZTA's proposed mitigation package is appropriate and will ensure that the Project's adverse effects on freshwater ecology are appropriately managed.

Vaughan Keesing
28 October 2026

APPENDIX A – RELEVANT QUALIFICATIONS AND EXPERIENCE

1 I am a Senior Ecologist and Director with the consulting firm of BlueGreen Ecology Limited. I hold a PhD in Ecology and a Bachelor of Science with First Class Honours in Zoology from Massey University. I also completed a certificate of research statistics.

2 I have been a consulting ecologist for the last 28 years. My skills lie in community ecology. I have specialist skills in the areas of plant ecology, entomology and freshwater ecology including wetlands. I have worked extensively in freshwater and terrestrial habitats throughout New Zealand.

3 I am a Member of the Ecological Society of New Zealand.

4 Prior to BlueGreen Ecology Limited, I was a partner in the consulting firm Boffa Miskell and had been a practising ecologist in Boffa Miskell for a little over 25 years.

5 Before that I held a Post Doctoral at Lincoln University (three years) where I taught applied ecology and undertook research.

6 My areas of expertise include both terrestrial and aquatic ecology. I have researched and prepared or co-authored around 30 published scientific research papers. I have supervised 4 PhD students. I have prepared ecological assessments with respect to resource consent applications, notices of requirement and for plan changes/policy statements. I have also presented ecological evidence at over 50 Council hearings, 5 Boards of Inquiry and at least 30 Environment Court hearings and one Court of Appeal and two criminal court cases.

7 Most projects I am involved with involve water crossings and management of water habitat and prevention of contaminant from discharges, identification of wetlands and effects and values of those wetlands. Those directly related to roading have included:

7.1 Extensive work on all facets of the waterways in Transmission Gully, from consenting to fish salvage, discharge effect monitoring, culvert design for fish passage, success monitoring, construction monitoring and all the components in between of road development for the last 15 years.

7.2 At the same time and starting in 2009, I researched and presented the evidence for MacKay's to Peka Peka and then undertook all of the design and monitoring of stream and wetland reconstruction, fish salvage and effects monitoring for that roading project, finishing, more or less, in 2016.

7.3 I also undertook the freshwater studies and effects considerations for the ALPURT extension of State Highway 1 between 1998 and 2006, collecting the fish and

macroinvertebrate data and then monitoring through construction.

7.4 I was the ecological reviewer for the Tauranga expressway (SH2 Ōmokoroa to Te Puna) reviewing all facets of that ecological assessment.

7.5 I was also involved as one of the freshwater experts on the Puhoi State Highway 1 (SH1) extension, and the SH16-18 extension as well as the SH20 west extension (all in Auckland).

7.6 I undertook the inventory and effects assessment for the Wēiti River crossing in 1999.

7.7 I recently completed the assessment of freshwater stream values and effects for the consented Cambridge to Piarere NZTA project, having calculated stream extent and effects and the management of those effects from culverting and realignments.

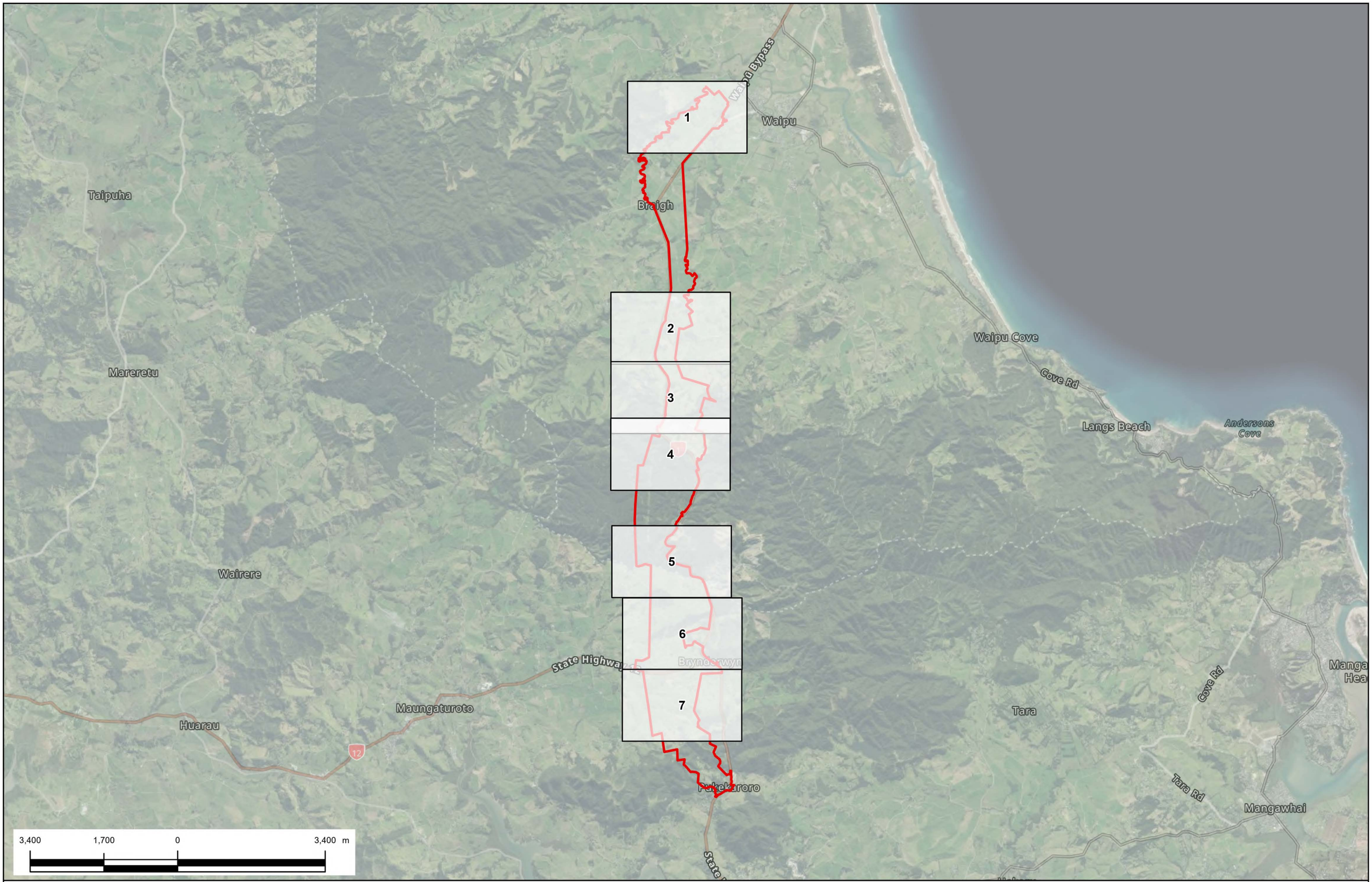
7.8 In terms of important wetland work I was a co author in identifying the significant wetlands of the West Coast region (which went through the Environment Court) and have numerous wetland identification cases most notably the Whiteman valley incident, Adams versus GWRC where I acted for the Upper Hutt Council and was successful and in achieving a successful appeal in the Page and Crosby versus GWRC wetland clearance incident.

7.9 I have been involved with many other projects involving water values, water uses, water contamination and culverting, bridging, diverting and creating streams. Each has involved field data gathering (fish, invertebrates, plants, water quality, habitat quality), analysis of the data, a values assessment, and an effects assessment. My role has also involved making recommendations as to management of discharges, fish passage, fish salvage, mitigation options and conditions of consent relating primarily to the monitoring and management of aquatic ecosystems.

APPENDIX B – REVISED WETLAND ASSESSMENT TABLE AND MAPS

Wetland #	Wetland Type	Indigenous biodiversity	Ecosystem health	Hydrological function	Value	
	Ahuroa Catchment					**Size(ha)**
1	Creeping butter cup drainage	Negligible	Poor	Negligible	Negligible	0.2
19	Creeping butter cup	Negligible	Poor	Negligible	Negligible	0.35
	Waihoihoi Catchment					
2	Exotic dominated: purslane, water pepper & rushes	Low	Poor	Low	Low	0.25
3	Juncus, creeping bent, buttercup	Negligible	Poor	Negligible	Negligible	0.16
4	Juncus, buttercup, creeping bent	Negligible	Poor	Negligible	Negligible	0.64
5	Juncus, creeping butter cup	Negligible	Poor	Negligible	Negligible	0.03
6	Juncus, creeping butter cup	Negligible	Poor	Negligible	Negligible	0.05
7	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Low	0.43
8	Raupo, Isolepis, water purslane, Juncus	High	Moderate	High	High	1.25
9	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Negligible	0.046
10	Juncus, Isolepis, Creeping butter cup	Negligible	Poor	Negligible	Negligible	0.074
11	Juncus, creeping buttercup, creeping bent, Gylceria.	Negligible	Poor	Negligible	Negligible	1.96
12	Kahikatea with creeping bent, Gylceria, water pepper, creping buttercup,	Negligible	Poor	Negligible	Low (High with fern bird)	0.4
13	Juncus, creeping butter cup, creeping bent.	Negligible	Poor	Negligible	Low (High with fern bird)	1.73
14	Wet pasture with Juncus and creeping bent	Negligible	Poor	Negligible	Negligible	0.53
15	Wet pasture with Juncus and creeping bent	Negligible	Poor	Negligible	Negligible	0.086
16	Lower, juncus, Gylceria, creeping bent, upper wet pasture, mid, raupo, kiekie, sedges	Low	Mostly poor, centrally some moderate condition	Negligible	Mostly low, but a central 1/3rd is of High value -Moderate.	0.43
17	Headwater small Isolepis and creeping butter cup	Negligible	Poor	Negligible	Negligible	0.007
18	Headwater small Isolepis and creeping butter cup	Negligible	Poor	Negligible	Negligible	0.005

Wetland #	Wetland Type	Indigenous biodiversity	Ecosystem health	Hydrological function	Value	
	Wairau Catchment					
20	Creeping bent, buttercup,	Negligible	Poor	Negligible	Negligible	0.006
21	Juncus, giant umbrella sedge, Isolepis sedgeland	Low	Mostly poor, some indigenous species present in scattered areas.	Negligible	Low	0.072
22	Creeping buttercup, cabbage tree	Negligible	Poor	Negligible	Low	0.012
23	Juncus, creeping bent and buttercup	Negligible	Poor	Negligible	Negligible	0.03
24	Raupō gully with edge willow	High	Fair	High	High	3.16
Q08/066	Open water, poplar, juncus, creeping bent and butter cup	Negligible	Poor	Moderate	Moderate (fauna)	4.54
Additional Wetland features not identified in Freshwater Assessment						
25	Exotic with some areas of indigenous wetland (0.04 ha)				Low (& High)	0.35-1.9
26	Exotic				Low	0.95
27	Indigenous				Low	0.24
28	Indigenous				Moderate	0.19
29	Exotic				Moderate	0.13
30	Exotic				Low	2.45
31	Exotic				Low	0.13
32	Exotic				Low	0.45
33	Exotic				Low	40,000
34	Not assessed				Not assessed	0.68
35	Not assessed				Not assessed	0.26
36	Not assessed				Not assessed	0.32
37	Not assessed				Not assessed	0.35
38	Indigenous				Moderate-High	0.44
39	Not assessed				Not assessed	1.01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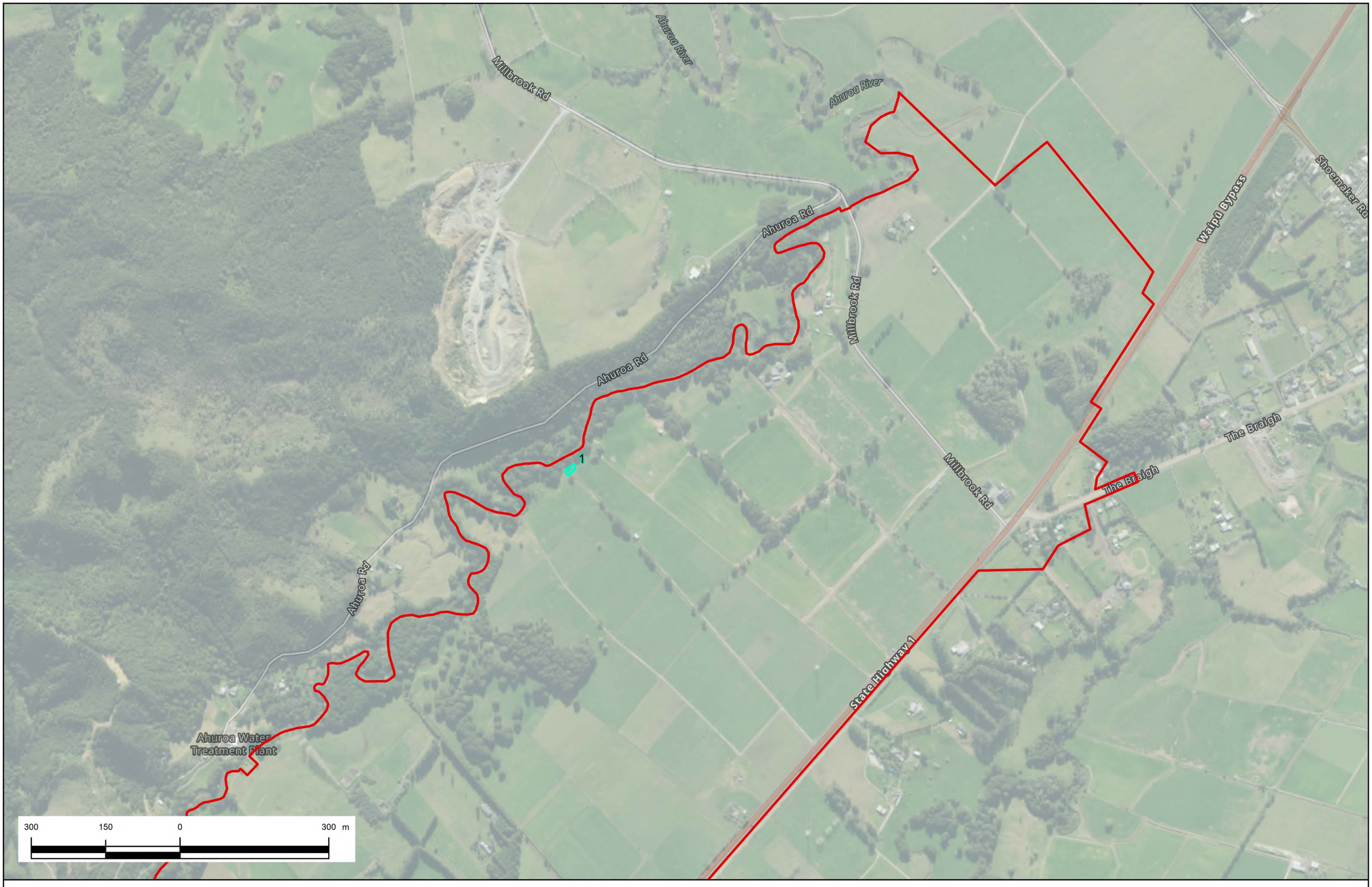

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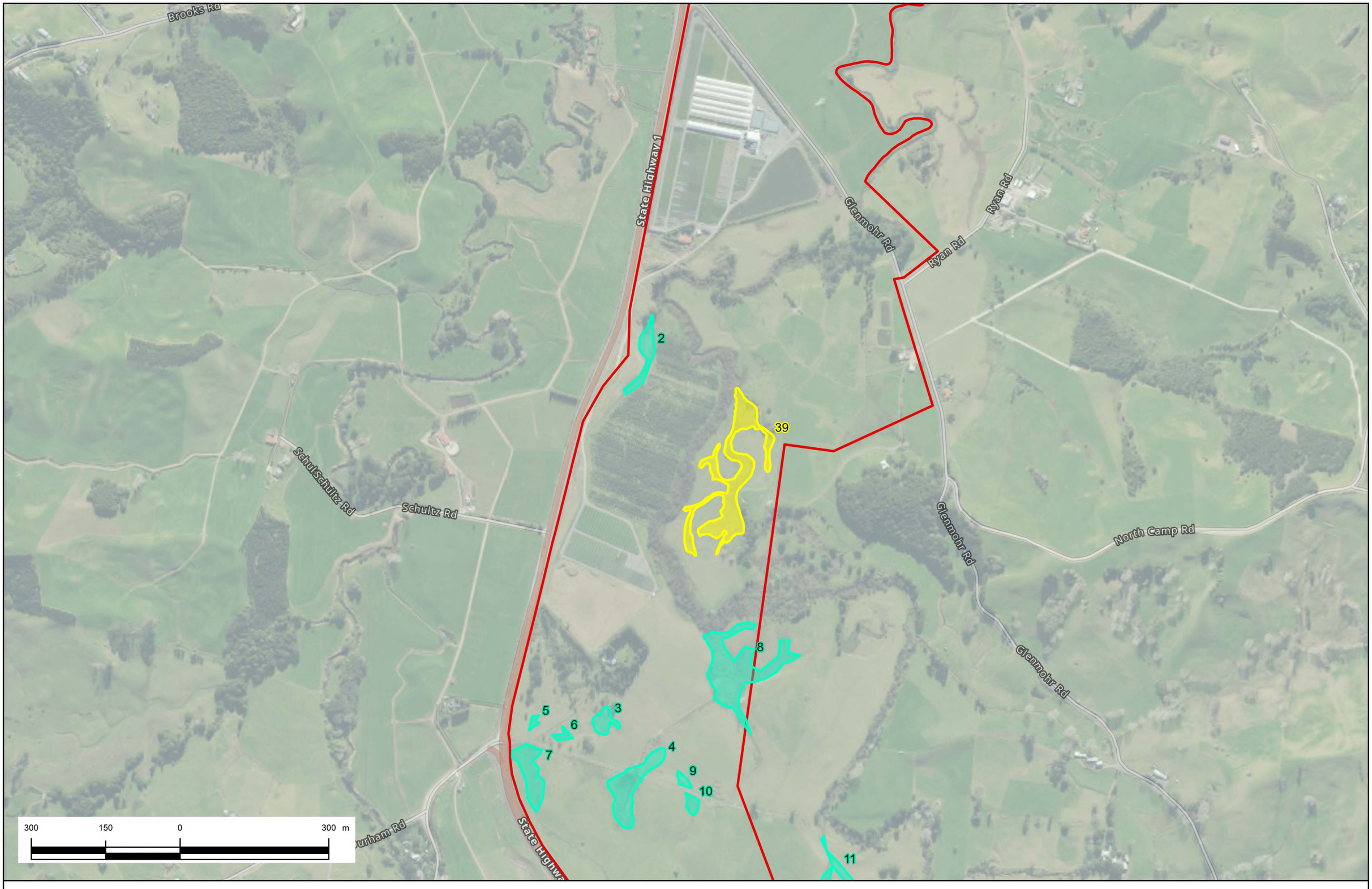

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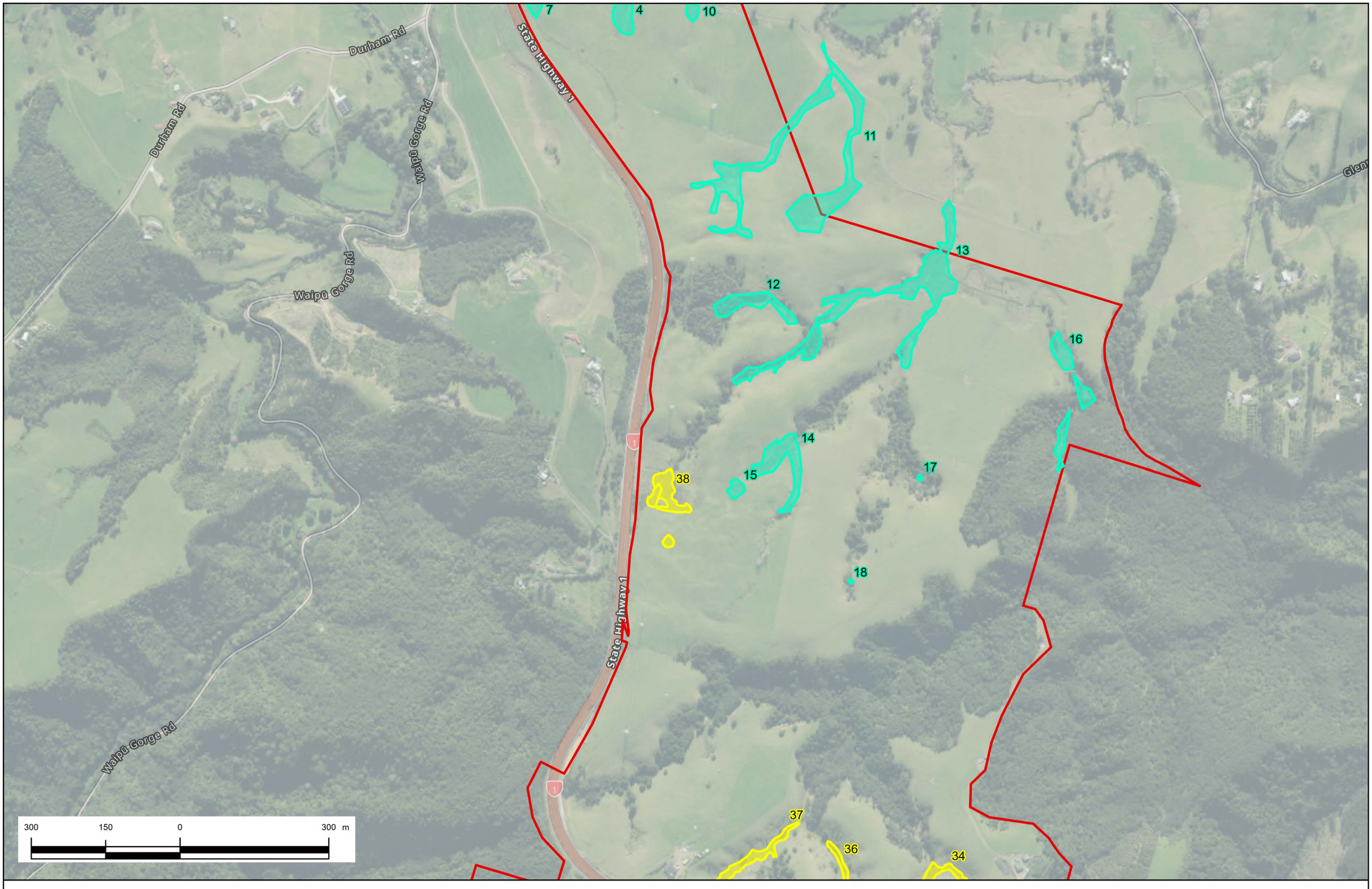

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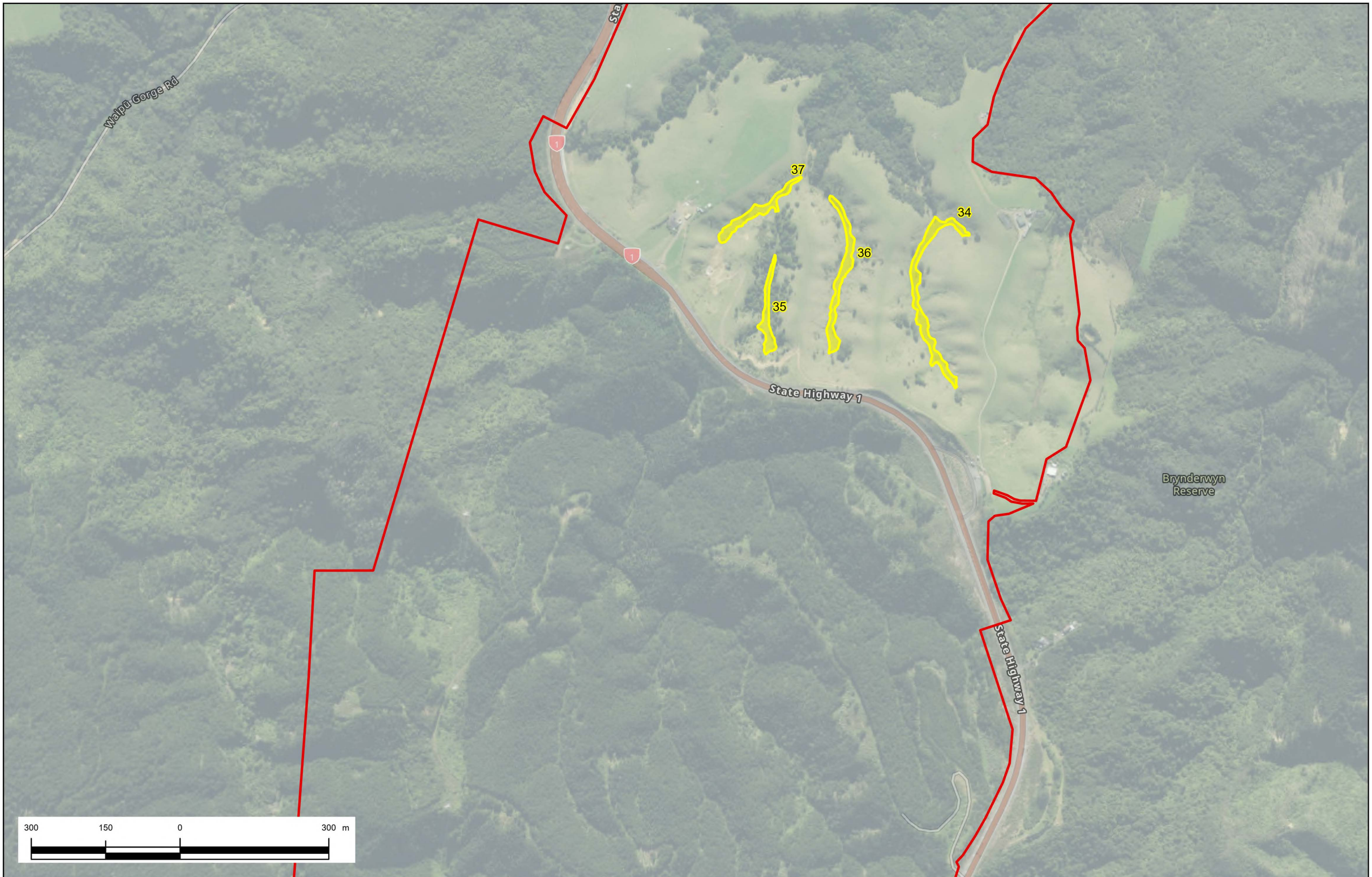

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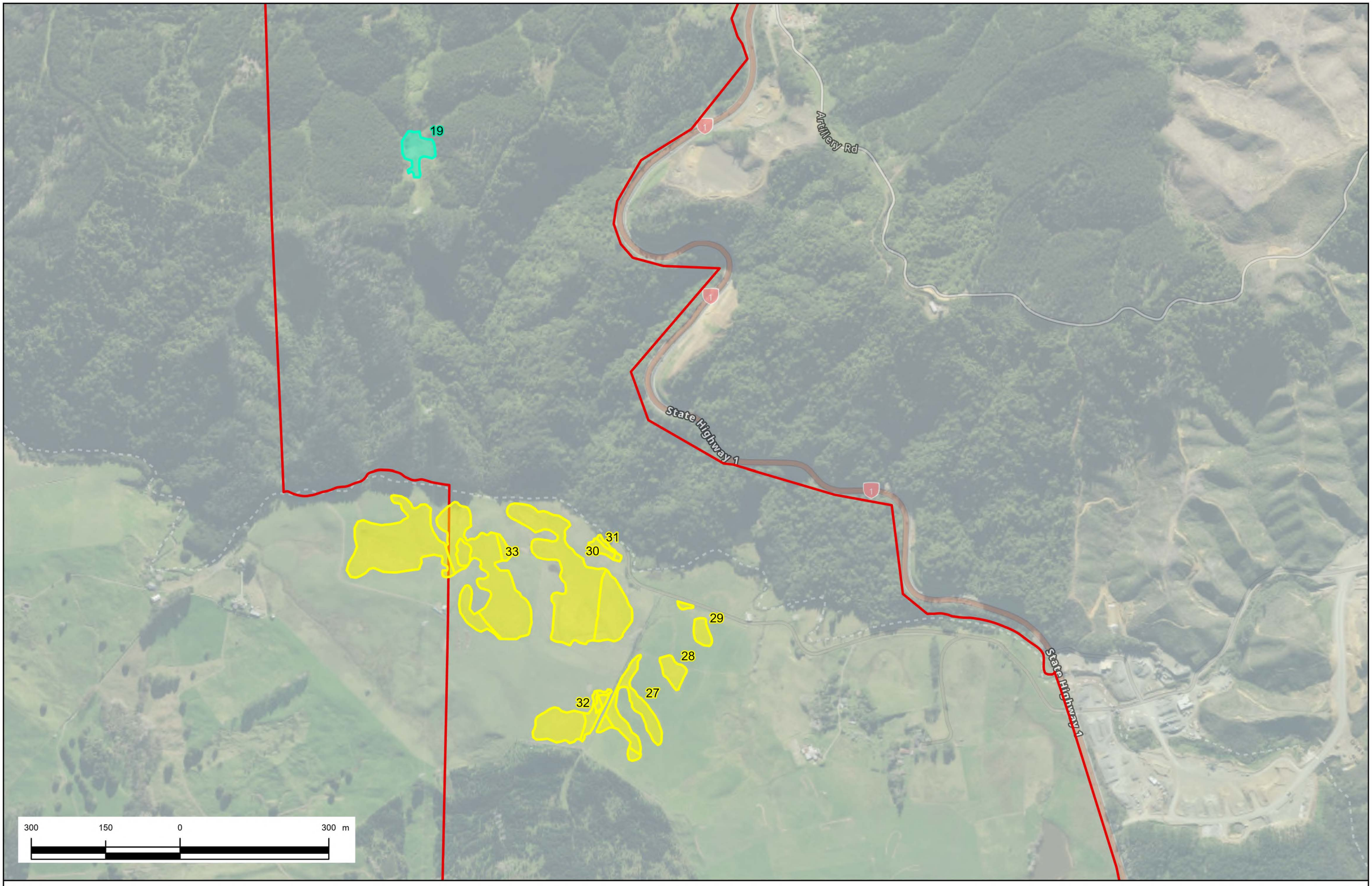

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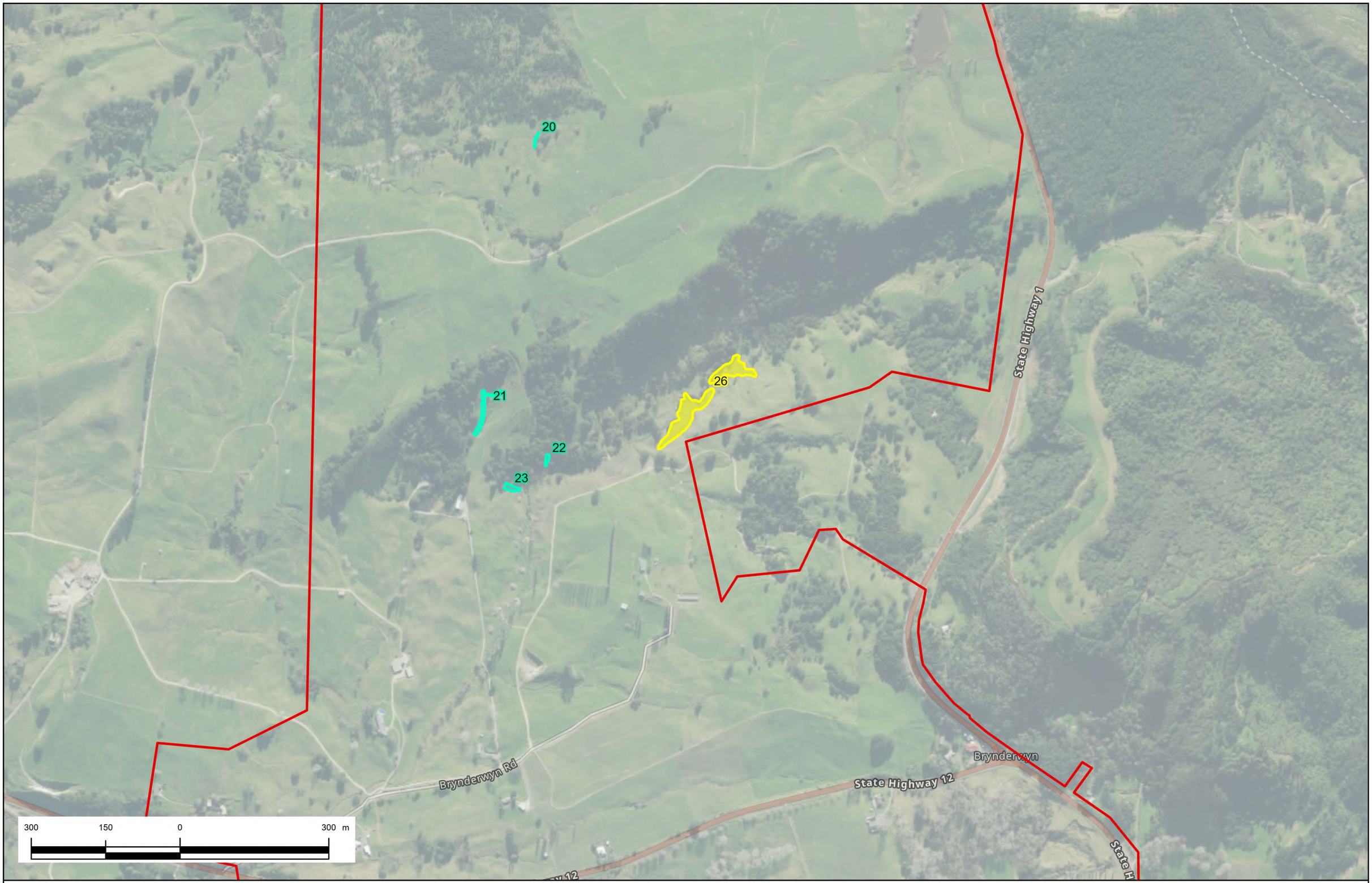

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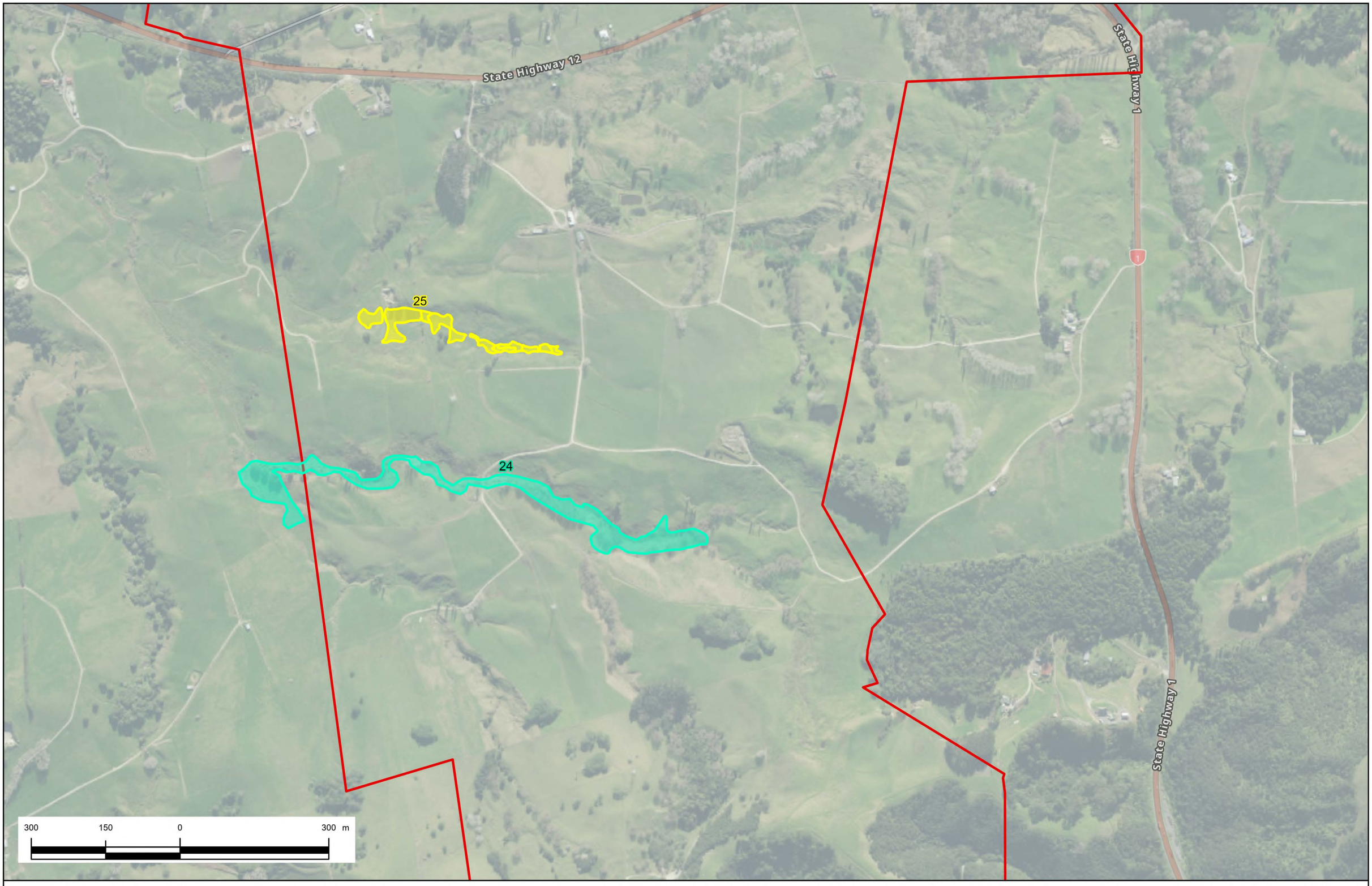

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