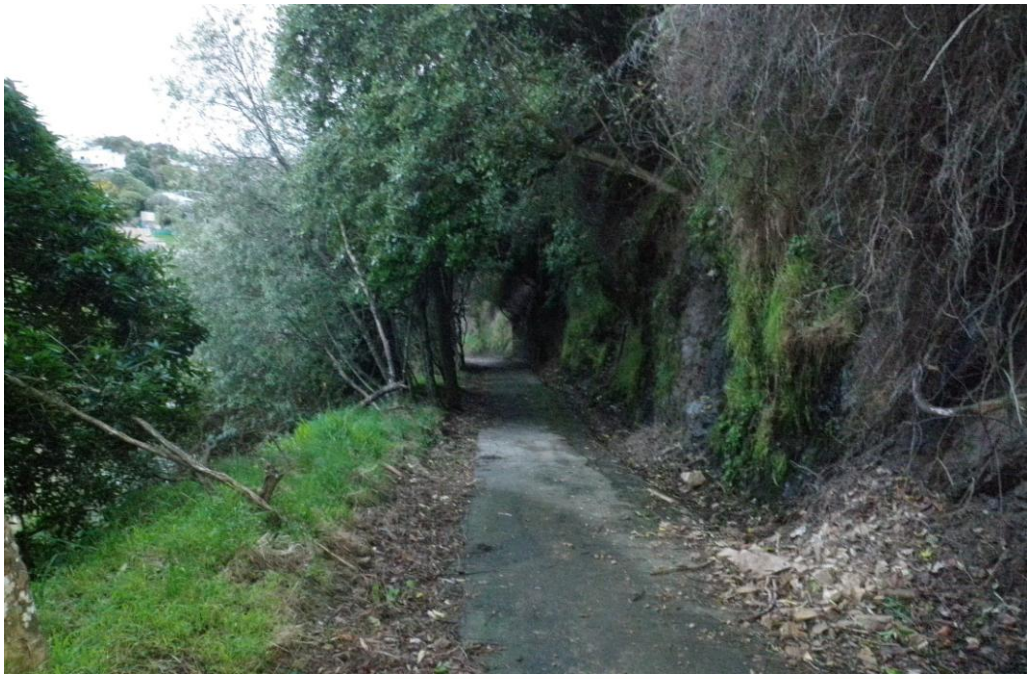





R2971b

ECOLOGICAL ASSESSMENT OF 55-85 CURTIS STREET, WELLINGTON, STAGE TWO

Wildlands

Providing outstanding ecological services to sustain and improve our environments

Ecological Assessment 55-85 Curtis Street, Wellington, Stage Two

Contract Report No. 2971b

Project Team:

Frances Forsyth - Report author.

Prepared for:

Wellington City Council

PO Box 2199

Wellington 6140

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Main Cover Photo: Old Karori Road, showing the overhanging vegetation buffer and the steep cut on the upper road margin.

WELLINGTON OFFICE: 7A SUNLIGHT GROVE, ELSDON, P.O. BOX 50-539, PORIRUA
Ph 04-237-7341; Fax 04-237-7496

HEAD OFFICE: 99 SALA STREET, P.O. BOX 7137, TE NGAE, ROTORUA
Ph 07-343-9017; Fax 07-343-9018, email ecology@wildlands.co.nz, www.wildlands.co.nz

CONTENTS

Reviewed and approved for release by:

_____

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

1. INTRODUCTION

This report provides an assessment of the relative significance of ecological features and values located at, and adjacent to, 55-85 Curtis St, Karori (Figure 1).

The Resource Management Act (RMA) 1991 Section 6(c) requires protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna as a matter of national importance. The RMA does not provide criteria for determining significance, although numerous examples of case law (e.g. Board of Inquiry Hauāuru Mā Raki Wind Farm 2011) have determined that criteria developed by regional and territorial authorities are sufficient for this purpose. Greater Wellington Regional Council criteria are listed in Appendix 1 of this report.

Features of interest associated with this assessment include the Kaiwharawhara Stream (which is piped across and just downstream of the property), indigenous vegetation, seepage wetlands, buffering vegetation, indigenous birds, and a glow-worm colony.

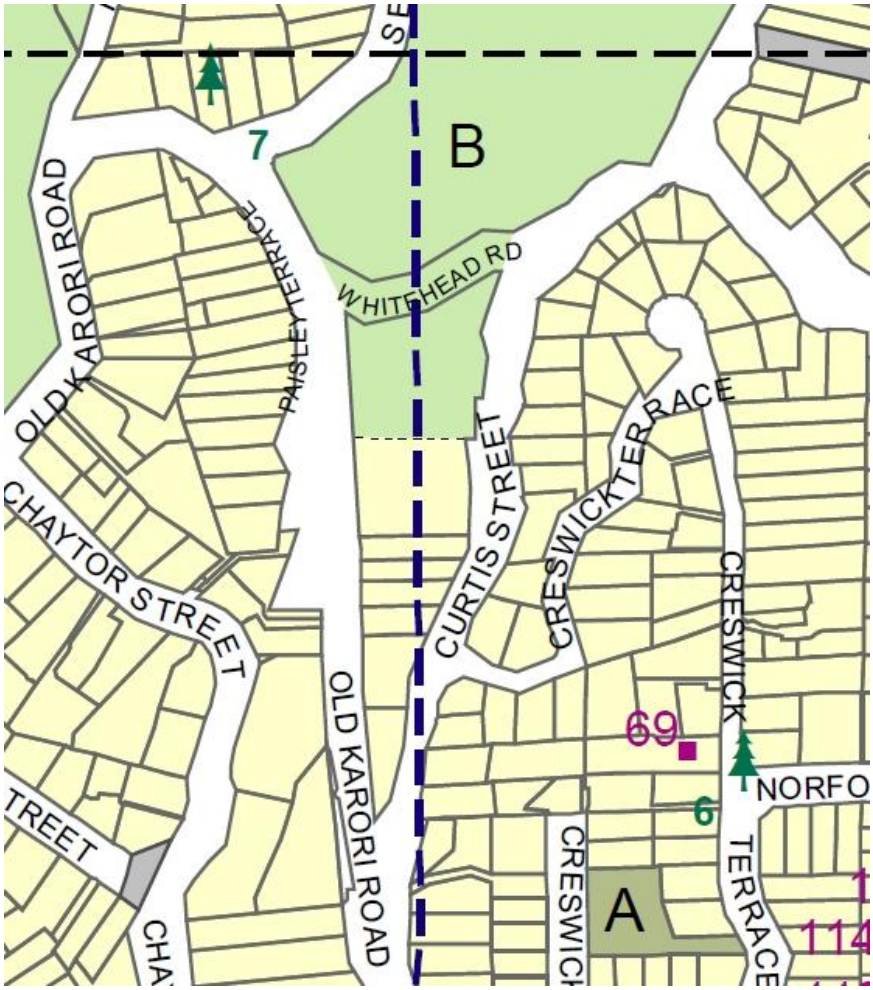

Figure 1: The site comprises all of the Parcel Lots between Old Karori Road, Curtis Street, and Whitehead Road. The dotted blue line represents Over Head Transmission Lines (WCC District Plan Map).

2. BACKGROUND

Site History

The 1.09 ha triangular piece of land at 55-85 Curtis Street is privately-owned and lies between two, very old, Wellington roads (Figures 1 and 2). These roads are only marginally wider than the original bullock tracks they replaced. Old Karori Road and Curtis Street were cut by hand in the early 1840s, with the "cut" rock being thrown into the narrow gully over a newly-culverted reach of Kaiwharawhara Stream. This culvert was later extended downstream (northwards), under a landfill known as the "Wilton Tip".

Since the road was originally formed, little change has occurred to the landform of this narrow gorge apart from a change of slope at the northern end of the site, which now rises, rather than sloping downwards, to Whitehead Road, which runs across the southern end of Wilton Tip. This slope area is currently zoned Open Space B. Old Karori Road was closed to vehicles following the construction of Whitehead Road in the late 1980s and is now part of the City to Sea Walkway.

Figure 2: Aerial view of the site, showing vegetation which has developed and formed a canopy over Old Karori Road.

Ecological Context

The land environment at 55-85 Curtis Street and the surrounding area is classified as Acutely Threatened (Land Environments of New Zealand Threatened Environments Classification). Environments with that classification have less than 10% of indigenous vegetation left and are likely to contain some of New Zealand's most severely reduced and poorly protected indigenous biodiversity (Walker *et al.* 2007).

3. METHODS

The site has been surveyed from the road on three occasions, twice in mid-July 2012, once in the evening to see glow-worms and also at dawn to listen for birds, and again on a fine day in August. All available literature about the area has been reviewed.

Information gathered from the literature review and site surveys has been assessed against Greater Wellington Regional Council (Proposed Regional Policy Statement S22, see Appendix 1) and Wellington City Council criteria (internal guidance document). Greater Wellington applies a five-level scoring system (see Appendix 2), with five (5) being the highest and one (1) the lowest. The detailed results of this assessment can be found in Appendix 3.

The Wellington Regional Policy Statement provides a set of criteria for identification of "indigenous ecosystems and habitats with significant indigenous biodiversity". These are standard criteria, commonly used for these types of assessments:

- Representativeness
- Rarity
- Diversity
- Ecological Context
  - Connectivity
  - Buffers
  - Seasonal or core habitat for protected or threatened species.

Buffer vegetation was assessed using Wellington City Council criteria for establishing the high ecological significance of an area that provides buffering services (WCC internal guidance document). These are:

- Important areas for connectivity of now fragmented indigenous habitats (movement of fauna, pollen or plant propagules).
- Provides buffering to a known site of ecological value.
- Critical seasonal or core habitat for a particular indigenous species.

In addition, the Proposed National Policy Statement on Biodiversity, Policy 6, recognises the value of buffering vegetation for the maintenance of indigenous biodiversity and states that decision makers should:

c. encourage the retention of existing vegetation, whether indigenous or not (but not including recognised pest plants), that provides:
   i. habitat for indigenous species;
   ii. seasonal food sources for indigenous species;
   iii. ecological linkage between areas and habitats identified in accordance with Policy 4;
   iv. a buffer to indigenous vegetation for areas and habitats identified in accordance with Policy 4.

In addition to using the above criteria a recent publication on the assessment of New Zealand's naturally uncommon ecosystems was consulted for the evaluation of the seepage wetlands (Holdaway *et al.* 2012). Holdaway *et al.* have applied globally applicable quantitative criteria, linked to current ecological theory predicting probability of elimination, to assess New Zealand's naturally uncommon ecosystems. These have been defined by Williams *et al.* (2007) as those with an estimated maximum total area of <0.5% of New Zealand's land area before human colonisation.

4. VEGETATION AND HABITATS

4.1 Indigenous forest

Regenerating secondary indigenous vegetation has returned to the western slopes of the valley (the left hand side of Figures 1 and 3), which also contains primary forest remnants (Park 1999). These are described by Park (1999) as having a canopy of hinau (*Elaeocarpus dentatus*), titoki (*Alectryon excelsus*), karaka (*Corynocarpus laevigatus*) and rewarewa (*Knightia excelsa*). The forest also contains some exotic species including Spanish broom (*Spartium junceum*). The middle and eastern slopes of the valley (centre and right of Figure 1) have a mix of indigenous vegetation and exotic species (see Section 4.4).

When Old Karori Road was originally formed, it created an abrupt edge to the remaining forest, allowing wind and sun to damage it, and weeds to invade. Over the last 160 years vegetation on the road reserve and on the Curtis Street site has established and grown, buffering and protecting the adjacent remnant forest. From its stature we presume that vegetation alongside Old Karori Road was supplemented in the late 1980s with additional planting. All of this vegetation now provides protection to the remnant forest and also provides habitat for indigenous fauna.

Since Park (1999) surveyed the forest remnants between Chaytor Street and Old Karori Road in 1998 more intensive pest control has been carried out both inside and outside Zealandia, including within this vegetation. There have also been a number of releases within Zealandia of birds that were previously extinct in Wellington City including stitchbird and North Island saddleback. These birds have dispersed from Zealandia and are now utilising habitat outside the predator-proof fence (Froude 2007). This successful re-establishment has been attributed to the effective control of pest animals (Miskelly 2005).

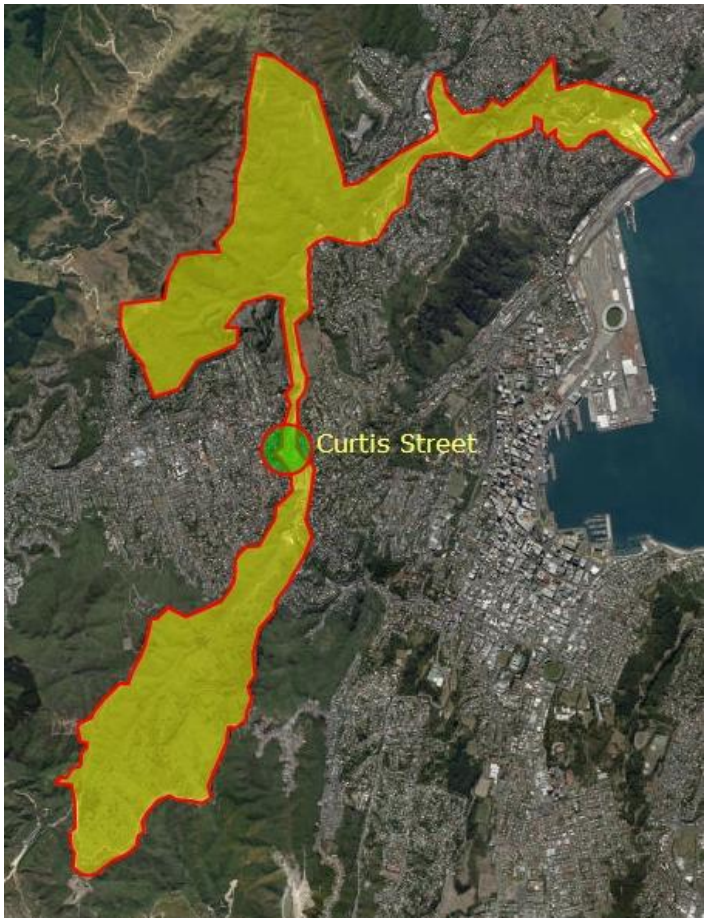

Figure 3: Aerial view of Wellington City, showing the ribbon of forest along Kaiwharawhara Stream.

The escarpment on the western side of the valley, including the forest remnants, is part of an almost continuous ribbon of indigenous forest (including large primary forest remnants) that reaches from the mouth of Kaiwharawhara Stream to the top of the catchment (Figure 4). This has been identified (Blaschke *et al*. 2004) as being a significant ecological corridor within Wellington City, providing habitat for a wide range of indigenous bird species and insects.

4.2 Seepage wetlands

Along the western side of Old Karori Road, water seeps out of the ground and down the vertical face of the rock to create several small wetlands, on the rock face itself, of the type known as seepages (Johnson and Gerbeaux 2004), (Figure 6). Seepage wetlands have been classified as historically rare terrestrial ecosystems by Williams *et al.* (2007). Rare ecosystems are defined as those having a total extent of less than 0.5% (i.e. < 134,000 ha) of New Zealand's total area (268,680 km^2).

The Holdaway *et al.* (2012) classification for seepages and flushes is 'Threatened-Endangered' based on the historical decline in ecological function of these already rare ecosystems. They identify threats to such ecosystems as being agriculture and invasion by non-native plants. Indicators for the ecological integrity of seepages include: non-native plant and animal abundance, native vegetation cover, water quality, and ecosystem disruption.

The wetlands on the Old Karori Road embankment have low levels of indigenous vascular vegetation cover and have been invaded by weeds. However, glow-worms are at their most abundant within these seepage wetlands.

4.3 Buffer vegetation

Vegetation on either side of Old Karori Road buffers and enhances the ecological values of the seepage wetland and indigenous forest, and provides habitat for indigenous birds and insects. It comprises mixed indigenous and exotic species, many of which appear to have been planted. The indigenous species are diverse and include large specimens of karaka (*Corynocarpus laevigatus*), ngaio (*Myoporum laetum*), kohuhu (*Pittosporum tenuifolium*) and mahoe (*Melicytus ramiflorus*). Exotic species include gorse (*Ulex europeus*), cherry (*Prunus avium*), walnut (*Juglans* sp.) and honeysuckle (*Lonicera japonica*).

The buffer vegetation along the eastern side of Old Karori Road is patchy, and does not provide protection to all of the seepage wetlands. This means that some areas of the wetlands are currently exposed to natural and artificial light, the drying effects of wind and sun, and incursion by weeds. These "edge effects" not only have adverse effects on the wetlands but also on the remnant indigenous forest, the birds and the insects. Figure 4 shows how buffer vegetation can protect areas of seepage wetland like those found at Old Karori Road.

The delineation of buffer vegetation within the Curtis Street site (Figure 5) has been drawn to include only that vegetation which currently contributes to the buffering effect.

4.4 Other vegetation at 55-85 Curtis Street

The remainder of the vegetation at the site falls into two categories: mown and rank grass, and mixed indigenous and exotic species (Figure 5). The mixed species comprise planted and regenerating indigenous plants (e.g. mahoe, *Pittosporum tenuifolium, Cyathea medullaris, Coprosma robusta*) and planted and self-sown exotic plants including many with generally weedy habits (gorse, cherry, blackberry and other weed species).

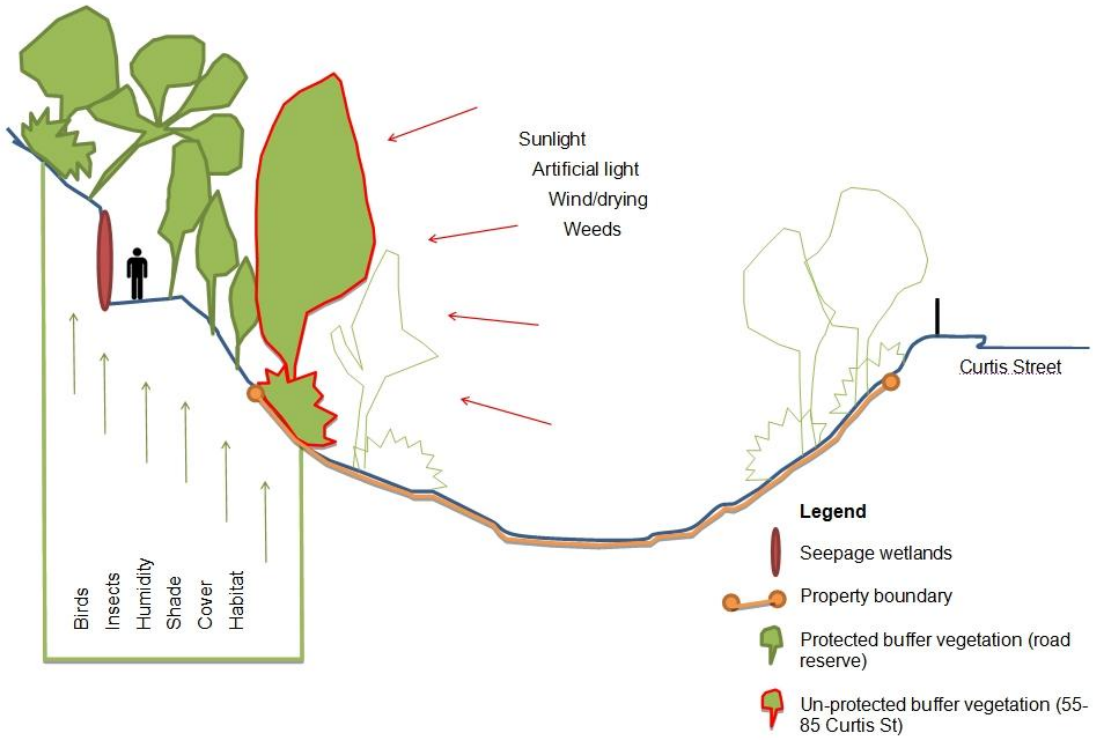

Figure 4: An example of the benefits of buffer vegetation. This profile view (not to scale) through the site shows how the area with the maximum width of existing buffering (see Figure 6), is able to protect the seepage wetlands and associated biodiversity.

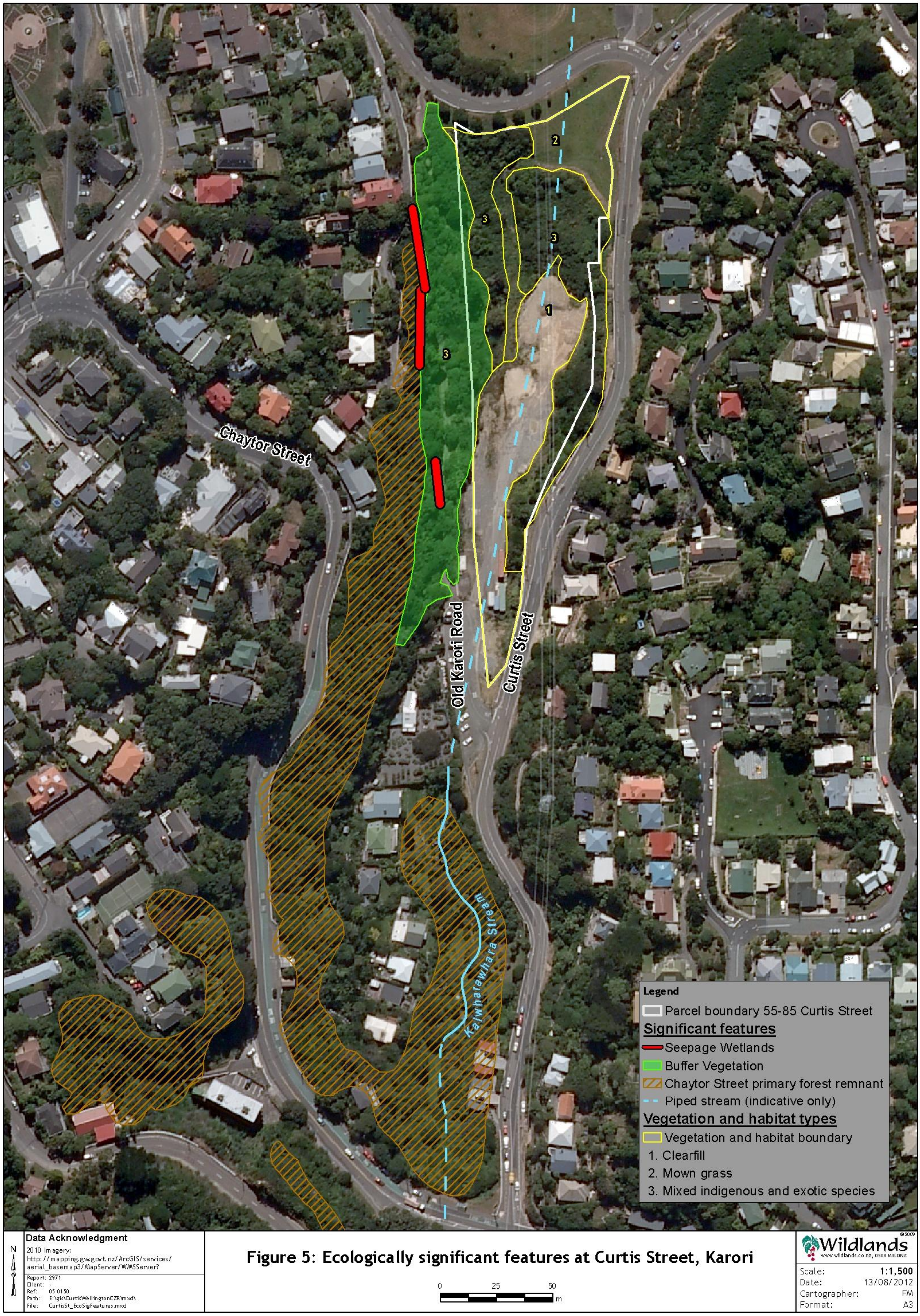

Figure 5: Ecologically significant features at Curtis Street, Karori

4.5 Kaiwharawhara Stream

Kaiwharawhara Stream is open and flows in a natural channel for most of its length, which is unusual for an urban stream. It is forested along much of its route (Figure 3) and teems with indigenous fish, eight species in all, including six with the national threat status of At Risk-Declining. It is rare for an urban stream to support such a wide diversity of fish species. Kaiwharawhara Stream is piped beneath 55-85 Curtis Street and the closed landfill to the north but still receives all of the stormwater from the land above.

The headwaters of Kaiwharawhara Stream within Zealandia have good water quality (Kingett Mitchell 2002). However, water quality deteriorates as the stream flows through the catchment in response to a combination of historic pollution, and inputs from closed landfills, the rail corridor and the City Council-owned stormwater network (Kingett Mitchell 2004).

There are signs that the cumulative effects of stormwater discharge are adversely affecting aquatic biodiversity in the Kaiwharawhara Stream and that a trigger point for adverse effects on ecological values may already have been reached. A trigger point is reached when populations fall to such low levels that recruitment fails. Without intervention local populations can then decline into extinction. Signs that the trigger point might have been reached include poor macroinvertebrate sampling scores (Milne and Perrie 2006), blow-outs of fish passes, and downward trends in freshwater fish recruitment, as discussed at a recent inter-agency meeting held at Greater Wellington Regional Council on 29 March 2012.

Perrie *et al.* (2012), found no significant change in the macroinvertebrate scores or any of the other water quality parameters monitored three kilometres downstream from Curtis Street over the period 2004-2011. This indicates that water quality in the downstream reaches is neither improving nor deteriorating.

5. FAUNA

5.1 Birds

Birds are common in woody vegetation in the vicinity of 55-85 Curtis Street. Hihi (stitchbird) and North Island saddleback were both observed in the buffer vegetation between Chaytor and Curtis Streets during the July 2012 field survey. Other birds likely to utilise this area include whitehead, bellbird and North Island robin. The presence of breeding populations of these birds in an urban context is very unusual. Corridors of indigenous vegetation (Figure 3) enable birds to move around the city and to obtain access to new breeding habitat as the populations grow.

5.2 Insects

The reach of open stream immediately to the south of 55-85 Curtis Street (Figures 5 and 6) is habitat for many animals, including insects with an aquatic nymph stage and a terrestrial adult stage. When these insects hatch into their flying stage they provide

valuable food for birds. Hihi and saddleback both feed on such insects. Tui, which have quite a balanced diet of both nectar and insects, eat mainly insects during the breeding season and also feed them to their young (Heather and Robertson 1996).

Aquatic insects such as mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera), the pollution sensitive EPT taxa, are known to disperse inland from lakes and streams for distances ranging between 60 m to several kilometres (Petersen *et al.* 1999, Collier and Quinn 2004; Petersen *et al.* 2004). This dispersal is greatest in forested catchments and means that daylight sections of stream in forested areas can make a valuable contribution to terrestrial ecosystems.

Another insect found in great numbers, below the tree-covered slopes above Old Karori Road, is the glow-worm (*Arachnocampa luminosa*). This is the larva of a small midge. At this site the colony is large (150 × 100 m) and dense. Glow-worms need damp sites, where the air is humid and still, to construct their sticky snares, which entrap various sorts of flying insects. Thus they will not thrive on the edges of forest but only within the calm, dark forest interior or in caves and tunnels.

Plate 1: An example of the glow worms at the Old Karori Road seepage wetland. The droplet spangled threads are the snares. The webbing below is likely to be made by a sheetweb spider intent on intercepting insects attracted by the glow worm light (pers comm. Phil Sirvid, Te Papa 1/11/2012).

Forest glow-worms also entrap spiders, plant hoppers and even millipedes (Te Ara, Encyclopaedia of New Zealand). Insects from the stream and riparian area will also be an important food source for the glow-worm colony. The size and density of this colony indicates that the habitat (substrate, water quality, light intensity, humidity, competition, and food in the form of other insects) is likely to be optimum.

Outdoor glow-worms (as opposed to the same species living in caves and tunnels) start glowing shortly after dark and usually shine all night. A glow-worm colony of

this extent and population size, and with excellent public access, is notable in an urban context. Other city sites with glow worms include Otari Wilton's Bush, Trelissick Park, Khandallah Park and Waimapihi Reserve, but the Old Karori Road population has a greater density of glow-worms per square metre than these other locations.

6. ECOLOGICAL SIGNIFICANCE

Due to the steep slopes in the area, and possibly, also, the proximity of the old landfill site, this area has remained relatively undeveloped. As a result, well-established, healthy terrestrial ecosystems are operating there. These include primary and secondary indigenous vegetation, diverse insect populations, and many bird species. There are also a variety of habitats including forest, and wetland (see Figure 5). Stream habitats up and downstream of the site have populations of indigenous fish. Birdwood Reserve was last sampled by the author in 2009 and the lower Kaiwharawhara in early 2012. These values have been assessed against significance criteria (Appendices 1 and 2) and are described in greater detail below.

A tabulation of the values that were assessed, the scores allocated, the significance assessment, and the justification for them can be found in Appendix 3.

As stand-alone indigenous vegetation the forest remnants themselves have low significance because they are neither structurally nor species diverse. However, the presence of threatened bird species utilising the forest habitat raises the significance of this vegetation to Regionally Significant.

6.1 Kaiwharawhara Stream

The small unpiped reach of Kaiwharawhara Stream to the south of 55-85 Curtis Street adds value to the terrestrial ecosystems of the area as it is a source for winged adult aquatic macroinvertebrates. These are a valuable food source for birds, especially during the breeding season, and for the glow worm colony.

The piped reach of stream under 55-85 Curtis Street and the old tip site is the receiving environment for stormwater from the surrounding residential land and from the Curtis Street site itself. This water flows into the lower reaches of Kaiwharawhara Stream which provides habitat for eight species of indigenous fish and for koura (freshwater crayfish) (NZ Freshwater Fish Database), including a number of threatened species (five fish species and koura) (Alibone *et al.* 2009).

The stream as a whole is Regionally Significant due to the presence of these species. However, their ability to utilise all available habitat in the catchment is limited by the presence of brown trout, pollution inputs from stormwater, erosion and scour from altered hydrology due to stormwater inputs, and barriers to fish passage such as perched culverts (also often caused by stormwater inputs).

6.2 Seepage wetlands

Seepages and flushes are naturally uncommon wetlands, threatened generally by a decline in function which can be assessed by the abundance of non-native plants and animals, the level of native vegetation cover, water quality, and ecosystem disruption (Holdaway *et al.* 2012). Seepage wetlands along Old Karori Road have low to moderate levels of weed invasion and ecosystem disruption due to the quality of the vegetation buffer around them. Water quality is likely to be good as most water pollutants run-off into the stream rather than through the groundwater system that supplies the seepages.

The seepage wetlands on Old Karori Road are classified Regionally Significant when assessed using Regional Council criteria because they are representative examples of such wetlands in the region, they are a naturally uncommon indigenous ecosystem, and they have connectivity with a number of other indigenous ecosystems including the forest remnants and the stream (the latter via the stormwater system).

Indigenous seepages and flushes in New Zealand have a national threat status of Endangered because they have suffered very severe decline (Holdaway *et al.* 2012).

6.3 Buffer vegetation

Vegetation, including some on the Curtis Street site, which buffers the forest remnants and the seepage wetland (shown in green in Figure 5) meets relevant criteria for Significant Buffer Vegetation listed in Section 3.

7. POTENTIAL EFFECTS OF DEVELOPMENT

The above findings have particular relevance when looking at the potential of the Curtis Street site for development. While none of the regionally significant ecosystems are present on the site they are so close that the buffering effect of site vegetation, including some exotic species, becomes important.

7.1 Remnant forest

All indigenous vegetation in this area enhances connectivity throughout the catchment and especially along the stream. Figure 3 illustrates that indigenous ecosystems in this part of the catchment are highly constrained by urban development, and that the small area of indigenous forest remaining in the area around 55-85 Curtis Street is especially important to retain connectivity. Being so narrow at this point, connectivity is particularly vulnerable to further vegetation clearance including any removal of buffering vegetation as a consequence of inappropriate use or development.

7.2 Kaiwharawhara Stream

Urban streams which are incorporated into the stormwater system such as the Kaiwharawhara are described as “peaky” or “flashy” because they rise quickly following rain and then fall to a lower base flow than the stream would have experienced before urbanisation. This causes erosion and harms freshwater

ecosystems. The stormwater also carries pollutants that harm fauna in the stream and its estuary, and may harm people who use the stream for recreation.

Although the stream is piped under 55-85 Curtis Street a high percentage of the stream follows its natural course above ground. The entire stream, piped or otherwise, is the receiving environment for all of the stormwater from the surrounding urban and commercial areas. Should the Curtis Street site be developed, with large areas of impermeable surfaces discharging to the WCC stormwater system, this will adversely affect downstream reaches of the Kaiwharawhara Stream. Although such effects are small, on an individual basis, the cumulative effects of increasing impermeable surfaces are significant.

7.3 Seepage wetlands

Seepage wetlands are nationally threatened ecosystems, and the examples under consideration are also regionally significant. Removal of buffer vegetation or reduction in the structural integrity of the buffer vegetation could severely affect the function of the wetland by opening it up to sun and wind. This could result in a major reduction in the population of glow-worms and invasion of the wetland by weeds.

7.4 Buffer vegetation

While only a small proportion of the buffering vegetation lies on the Curtis Street site, the land here is very steep and some trees on the Curtis Street site are tall. Some trees on the Curtis Street site make a significant contribution to the buffering effect and their removal would compromise the structural integrity of the buffer, opening the buffer itself up to edge effects such as wind damage, as well as exposing the seepage wetlands (Figures 4 and Figure 6). Of the vegetation on the Curtis Street site, only that which materially acts as a buffer has been delineated as such.

Should the buffer vegetation on the Curtis Street site be removed the effects would require mitigation in the form of infill planting along the eastern side of Old Karori Road, and in particular on the slope immediately beside the boundary with 55-85 Curtis Street (Appendix 4). Particular attention to species choice will be required if vegetation removal is followed by earthworks. In that event the preferred goal would be the establishment of a self-sustaining, dense framework of vegetation from the ground up.

All buffer vegetation will require careful management if the significant values of neighbouring ecosystems are to be protected. While weedy species will need to be removed, the space created by their loss will need to be filled with rapidly-growing, eco-sourced, indigenous plant species in order to recreate and maintain the integrity of the buffer.

7.5 Council policy on biodiversity

The Council's Biodiversity Action Plan, adopted in September 2007, identifies issues affecting biodiversity in the city and objectives and actions for the continuing protection and restoration of Wellington's indigenous biodiversity. It states that the Council will protect Wellington's biodiversity from further fragmentation and loss by

actively protecting sites that collectively represent the full range of biodiversity in the city. The main issues for wetlands are identified as being loss of buffers and the intact corridors of vegetation that link wetlands with the landscape. One of the main issues for streams is the increasing area of impermeable surfaces in the city.

The Action Plan also has objectives for the provision of RMA and policy protection for sites with ecological significance (Objective 2.3), and the restoration of indigenous ecosystems to a healthy state (Objective 3.1).

8. CONCLUSION

The forest ecosystem (and associated bird community), the stream ecosystem (and associated winged insect community) and the seepage wetlands (and associated insect community) adjacent to 55-85 Curtis Street have been evaluated as regionally significant. As a result indigenous vegetation, fauna and ecosystems on the land and in the stream are considered to meet the criteria for significance under Section 6(c) of the RMA. Buffer vegetation on Old Karori Road and on the subject property is also ecologically significant and worthy of protection, because it protects other significant features.

Buffer vegetation is recognised in the Proposed National Policy Statement on Biodiversity, the Greater Wellington Proposed Regional Policy Statement and in the Wellington City Council Biodiversity Action Plan as providing important protection for representative, rare, or diverse indigenous ecosystems and habitats. Removal of the buffer vegetation which lies within 55-85 Curtis Street would, potentially, have significant effects on the forest and seepage wetland features. Appendix 4 contains recommendations for potential mitigation actions in the event that the property owner might wish to develop the site and remove this vegetation.

Figure 6: Extent of buffer vegetation within the boundary at 55-85 Curtis Street, Karori

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GREATER WELLINGTON ECOLOGICAL EVALUATION CRITERIA

Proposed RPS Policy 22 (Final): Identifying indigenous ecosystems and habitats with significant indigenous biodiversity values - district and regional plans

District and regional plans shall identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values; these ecosystems and habitats will be considered significant if they meet one or more of the following criteria:

(a) Representativeness: the ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystem and habitat types in a district or region, and:

  (i) are no longer commonplace (less than about 30% remaining); or
  (ii) are poorly represented in existing protected areas (less than about 20% legally protected).

(b) Rarity: the ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

(c) Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

(d) Ecological context of an area: the ecosystem or habitat:

  (i) enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or
  (ii) provides seasonal or core habitat for protected or threatened indigenous species.

(e) Tangata whenua values: the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori.

Explanation

Policy 22 sets out criteria as guidance that must be considered in identifying indigenous *ecosystems* and *habitats* with significant *biodiversity* values. Wellington Regional Council, and district and city councils are required to assess indigenous ecosystems and habitats against all the criteria but the relevance of each will depend on the individual cases. To be classed as having significant biodiversity values, an indigenous ecosystem or habitat must fit one or more of the listed criteria. Wellington Regional Council and district and city councils will need to engage directly with land owners and work collaboratively with them to identify areas, undertake field evaluation, and assess significance. Policy 22 will ensure that significant biodiversity values are identified in district and regional plans in a consistent way.

Indigenous ecosystems and habitats can have additional values of significance to tangata whenua. There are a number of indigenous ecosystems and habitats across the region that are significant to tangata whenua for their ecological characteristics. These ecosystems will be considered for significance under this policy if they still exhibit the ecosystem functions which are considered significant by tangata whenua. Access and use of any identified areas would be subject to landowner agreement. Wellington Regional Council and district and city councils will need to engage directly with tangata whenua and work collaboratively with them and other stakeholders, including landowners, to identify areas under this criterion.

Regional plans will identify indigenous ecosystems and habitats with significant biodiversity values in the coastal marine area, wetlands and the beds of *lakes* and *rivers*. District plans will identify indigenous ecosystems and habitats with significant biodiversity values for all land, except the *coastal marine area* and the beds of lakes and rivers.

Policy 23: Protecting indigenous ecosystems and habitats with significant indigenous biodiversity values - district and regional plans

District and regional plans shall include policies, rules and methods to protect indigenous ecosystems and habitats with significant indigenous biodiversity values from inappropriate subdivision, use and development.

Explanation

Policy 23 applies to provisions in regional and district plans.

Table 16 in Appendix 1 identifies rivers and lakes with significant *indigenous ecosystems* and habitats with significant indigenous biodiversity values by applying criteria taken from Policy 22 of rarity (habitat for *threatened* indigenous fish species) and diversity (high macroinvertebrate community health, habitat for six or more migratory indigenous fish species)

Policy 46 will need to be considered alongside Policy 23 when changing, varying or reviewing a regional or district plan.

Policy 23 is not intended to prevent change, but rather to ensure that change is carefully considered and is appropriate in relation to the biodiversity values identified in Policy 22.

THRESHOLDS FOR DETERMINING THE LOCAL, REGIONAL AND NATIONAL SIGNIFICANCE OF WETLANDS IN THE WELLINGTON REGION

Significance Level	Threshold
National	A score of '5' in any of the following significance criteria described in Appendix 2: - Representative - Habitats - Flora - Fauna - Communities.
Regional	A score of '4' in any of the following significance criteria described in Appendix 2: - Representative - Habitats - Flora - Fauna - Communities. <u>OR</u> Three or more scores of '3' in any of the following significance criteria described in Appendix 2: - Representative - Habitats - Flora - Fauna - Communities.
Local	A score of '2' in any of the significance criteria described in Appendix 2.

SIGNIFICANCE ASSESSMENT AND RANKING OF BIODIVERSITY VALUES AT AND ADJACENT TO 55-85 CURTIS STREET

Table 1: Features, issues, and ecological rankings associated with the Chaytor Street primary forest remnant.

	Chaytor Street/Old Karori Road Primary Forest Remnant
Site Summary	An area of primary forest containing hinau, tawa and rewarewa.
Adjacent Land Use	Urban residential.
Condition	Edge effects.
Land Management Issues	Road Reserve, some weed encroachment.
Representativeness	Lowland forest that retains only limited elements that are typical of the natural diversity of an Ecological District. Score = 2.
LENZ Threat Category	Acutely Threatened. Score = 5.
Habitats	A single rare/ uncommon indigenous habitat/ community recorded. Site small. Score = 3.
Flora	No rare or uncommon flora recorded. Score = 1.
Fauna	A small number (2 or more) nationally threatened species (Stitchbird, NI Saddleback). Score = 4.
Communities	Low diversity of ecosystem types. Score = 2.
Connectivity	Physical connection to wetland and stream but modification limits ecological service. Score = 3.
Migrant Birds - Seasonal	Several locally migrant species (Kereru and Tui). Score = 2.
Significance Level	Regionally Significant – (A score of four for fauna).
Significance Justification	A score of four for fauna.

Table 2: Features, issues, and ecological rankings associated with the Kaiwharawhara Stream.

	Kaiwharawhara Stream
Site Summary	An urban Wellington stream with two main tributaries. One with headwaters in Zealandia and passing through Otari-Wilton's Bush, the other with multiple headwater tributaries in the north western hills of Wellington. The estuary is on Wellington Harbour and has a priority ranking of Low in the draft version of Estuarine systems in the lower North Island (DOC 2012).
Adjacent Land Use	Pasture, green belt, reserve and urban residential.
Condition	Some water quality issues related to stormwater discharge and the proximity of the transport corridor.
Land Management Issues	Many reaches are subject to riparian restoration or are in natural forest.
Representativeness	Typical and characteristic example of original or current diversity of streams in the ED. Other similar streams in the Ecological District are Porirua Stream, Korokoro Stream and Pauatahanui Stream. Score = 3.
LENZ Threat Category	Acutely Threatened. Score = 5.
Habitats	Not Applicable.
Flora	Not Applicable.
Fauna	Small number of two or more Nationally Threatened spp (5 fish species plus koura). Score = 4.
Communities	High diversity of indigenous communities on a moderate scale, high diversity of flora and fauna. Score = 4.
Connectivity	Links a number of significant forest areas (Zealandia, Otari-Wilton's Bush, Treslissick Park, Huntleigh Reserve, Khandallah Reserve) plus estuary. Not

	Kaiwharawhara Stream
	100% functionally natural, small modifications (dams & culverts) limit ecological service. Score = 3.
Migrant Birds - Seasonal	Locally migrant species: kereru and tui. Score = 2.
Significance Level	Regionally Significant (Score of 4 in either representativeness, habitats, flora, fauna, communities OR three or more scores of 3).
Significance Justification	Overall scores: two 3s and two 4s.

Table 3: Features, issues, and ecological rankings associated with the seepage wetlands adjacent to Old Karori Road.

	Seepage Wetlands Old Karori Road
Site Summary	A steeply sloping area of approximately 150 × 60 m^2 which carries a small but steady flow of surface water, the volume of which is less than would be considered a spring or stream but which sustains plants (mosses) and animals (glow-worms) that are adapted to wet conditions.
Adjacent Land	Forested reserve and urban residential.
Condition	Weed encroachment.
Land Management Issues	Road Reserve, some buffer planting but requires more.
Representativeness	Typical and characteristic example of original or current diversity of seeps in the Ecological District. Score = 3.
LENZ Threat Category	Acutely Threatened. Score = 5.
Habitats	A single indigenous habitat (wetland seepage) that is uncommon. Score = 3.
Flora	Mosses (species identifications not undertaken).
Fauna	No rare or uncommon fauna recorded. Score = 1.
Communities	Wetland monoculture, single wetland type and low species diversity. Score =1.
Connectivity	Physical connection to indigenous forest and stream but modification limits ecological service. Score = 3.
Migrant Birds - Seasonal	Several locally migrant spp. Kereru and Tui. Score = 2.
Significance Level	Regionally Significant (three or more scores of 3).
Significance Justification	Three 3s.

RECOMMENDATIONS FOR MITIGATION OF POTENTIAL EFFECTS SHOULD 55-85 CURTIS STREET BE DEVELOPED

Buffer vegetation

Removal of buffer vegetation which lies within 55-85 Curtis Street would, potentially, have significant effects on the forest, and wetland features in the surrounding landscape. These effects include:

- Reduced connectivity within the wetland/forest area and between this site and others in the catchment. This limits the movement of animals and plant propagules and reduces the gene pools for these organisms. It can lead to population bottlenecks and local extinctions.
- Increased light pollution. This will affect the number of hours that glow worms shine for and therefore, their ability to attract food for themselves and other animals such as sheetweb spiders.
- Increased drying. This will reduce the variety of indigenous species that can live in the seepage wetland and change conditions to those that favour weed species.
- Increased air movement. This will reduce the length of lure that a glow worm can produce and limit its ability to catch insects. It will also increase drying. Wind could damage remaining vegetation.
- Increased invasion by weeds.
- Reduced habitat for birds, reptiles and insects.

Kaiwharawhara Stream

Development of the site could potentially affect the stream by reducing permeability of the ground surface..

- This increases the 'flashiness' of the stream with associated stream bank erosion and scouring below culvert exit points. It can lead to impaired water quality, loss of food and habitat for freshwater organisms, and barriers to fish passage.

Mitigation options

There is potential to mitigate the effects of buffer removal and reduced permeability by implementing measures on both the site itself and on Old Karori Road. Mitigation options include:

- Planting the bank above the area of vegetation loss and between the Curtis Street site and Old Karori Road with the goal of establishing a dense, self-sustaining forest plant community.
  - Mass planting of large specimens (PB45 or PB60 size) in key areas.

  - Select species that will seal the edge of the buffer at ground-level, others that will grow rapidly, and some that will be tall, long lived and will provide food for birds.
- Extend this planting along the length of this section of Old Karori Road.
- Improve the growth and health of existing trees between the Curtis Street site and Old Karori Road.
  - Apply fertiliser and deep mulch.
- Address any gaps from vegetation removal that planting can not remedy in the short term. These would be temporary solutions for instance, installing occasional brush fence panels at the eastern edge of the Old Karori Road pathway (Plate 2).
- In the remaining buffer remove only those plants listed in the Regional Pest Management Strategy. Less damaging environmental weeds and exotic trees can be removed gradually as the replacement buffer planting becomes established.
  - When conditions are appropriate for gradual removal of exotic trees these can be poisoned and left standing as support for indigenous climbers such as *Muehlenbeckia australis*, preferred habitat for the moth *Morova subfasciata*.
- Integrate Low Impact Urban Design principles into any site development plans with the goal of minimising the effects of increased impervious surfaces on Kaiwharawhara Stream.
- Design exterior lighting at the site to avoid light pollution at the wetlands
- Limit street lighting on Old Karori Road to the top of the pathway at Whitehead Road and the bottom outside the childcare centre.

Plate 2: An example of brushwood panels that can be used to create temporary, short-term shade and protection from wind.

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

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

Regional Offices located in
Auckland, Hamilton, Tauranga,
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