

Investigation for a Potential Plan Change – Three Parks North Ballantyne Road - Wanaka

Assessment of Ecological Values

19 June 2010

Contract Report: NS 99/10

Prepared on behalf of:
Ballantyne Investments Ltd

Commissioned by:
Patterson Pitts Partners (Wanaka) Ltd

Natural Solutions *for Nature* Limited

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1.0 Introduction

The Queenstown Lakes District Council ('QLDC') has initiated a Council led but privately funded investigation into a Plan Change that would rezone 36.8 hectares of land currently zoned as Rural General to provide for residential and visitor accommodation as well as commercial retail activities (refer to the Wanaka Structure Plan (Attachment 1). The extent of the proposed Plan Change is identified in the Plan titled 'Site Survey of Lot 2 DP 304423', provided and labelled as Attachment 2.

Natural Solutions for Nature Ltd was requested by Patterson Pitts Partners (Wanaka) Ltd to prepare an ecological report in respect of this proposal.

1.1 Site Location

The land is contiguous with the Three Parks Zone, and is bounded by the Luggate – Wanaka Highway (SH 84), Ballantyne Road and the Wanaka Golf Course (refer to **Figure 1**).

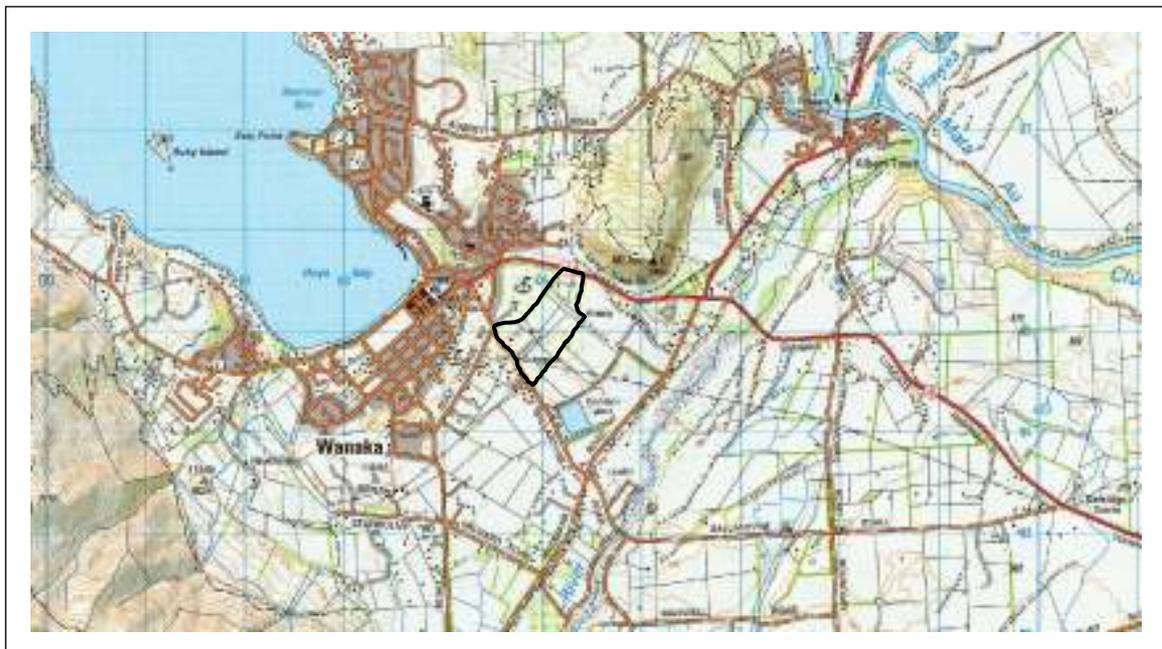


Figure 1: Location of the proposed Plan Change area – Three Parks North, Wanaka
Source: MapToaster: NZMS 260 F40 – 2006

This assessment and report will determine whether there are any ecological values present that may constrain or influence outcomes of the proposed Plan Change.

Consideration of the potential alternatives, benefits or detractions of the proposal will be incorporated into the assessment and recommendations provided within this report.

The findings of this report will assist the consideration of whether the land is suitable for urban uses and the collegiate consideration of the consultant landscape architect regarding whether there are values present that should influence the development of boundaries between open space, low, medium or high density residential and retail areas.

1.2 Structure of Report

The following structure has been adopted in undertaking the assessment and reporting on the effects and recommendations of the proposed Plan Change:

1. Introduction
2. Summary of documents considered for the Ecological Assessment
3. Method of assessment
4. Description of the values present
5. Significance of values present
6. Actual or potential effect on the environment
7. Summary and recommendations for mitigation and enhancement
8. References
9. Attachments

2.0 Summary of documents considered

The documents considered in preparing this report were:

- The Resource Management Act 1991 No 69 (as at 04 June, 2009) – “the Act”; Sections 5, 6 and 7, as well as Schedule 1 part 2 section 22 and schedule 4
- The National Priorities for Protecting Rare and Threatened Biodiversity on Private Land which were published by the Ministry for the Environment in 2007.
- The Land Environment of New Zealand (LENZ) (Leathwick, et.al., 2003) and Threatened Environment Classification (TEC) (Walker, 2007).
- The New Zealand Threat Classification system developed by the Department of Conservation (Molloy et al (2002)) and updated in 2005 and 2007.
- The New Zealand Biodiversity Strategy released in 2000.
- The District Wide issues within the Partially Operative District Plan, Part 4.1.4 Objectives and Policies for Nature Conservation Values.
- Standards NZ HB 44:2001 Subdivision for People and the Environment Standards Council and the New Zealand Institute of Surveyors

2.1 The Resource Management Act, 1991 ('the Act')

The primary purpose of the Act¹ is to promote the sustainable management of natural and physical resources.

In achieving the purpose of the Act, this assessment has given particular consideration to the following sections and subsections:

- Whether or not the plan change area contains significant indigenous vegetation and significant habitats of indigenous fauna and if so, the extent to which these may be affected and therefore protected - *Section 6(c)*
- The maintenance and enhancement of amenity values - *Section 7(c)*
- Intrinsic values of ecosystems – *Section 7(d)*
- Maintenance and enhancement of the quality of the environment – *Section 7(f)*
- Any finite characteristics of natural and physical resources – *Section 7(g)*

2.2 National Priorities for Protecting Rare and Threatened Biodiversity on Private Land

Four National Priorities were developed with the intention of focusing conservation efforts on the protection of some of our most rare and threatened ecosystems and species found on private land.

They are:

National Priority 1:

To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV), that have 20% or less remaining in indigenous cover.

National Priority 2:

To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.

National Priority 3:

To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

National Priority 4:

To protect habitats of acutely and chronically threatened indigenous species.

Use of the terms 'acutely' and 'chronically' threatened species in the statement of national priorities are derived from the New Zealand Threat Classification system developed by the Department of Conservation Molloy et al (2002).

¹ RMA section 5

This assessment will determine the potential to meet or address the National Priorities through the proposed Plan Change.

2.3 The Land Environment of New Zealand (LENZ) and Threatened Environment Classification (TEC) systems

The justification for the National Priorities is provided by the Land Environment of New Zealand (LENZ) and Threatened Environment Classification (TEC) systems combined with the Threat Classification List systems developed by the Department of Conservation. Together they provide a framework which assists in the determination of whether values on private property are significant and require protection.

LENZ is a national environment-based classification of ecosystems mapped across New Zealand's landscape. LENZ uses 15 climate, landform and soil variables likely to influence the distribution of species to classify and map areas that have similar environmental or ecosystem character. These are called 'land environments'. Each land environment may contain variability but they are likely to have similar groups of species and similar biological interactions and processes which enable a comparison of representativeness to be made (Leathwick, et.al.,2003; Walker, et.al., 2007).

When LENZ is combined with an analysis of changes in the Land Cover Database and these data are compared to a national database of the protective status of land it becomes possible to identify broad patterns of change, vulnerability and protection. The Threatened Environment Classification (TEC) assigns one of six threat categories on the basis of:

- (a) past loss of indigenous vegetation (%indigenous vegetation left), and
- (b) current legal protection (% protected)

Table 1 The six threat categories

Category	Criteria	Name
1	< 10% indigenous vegetation left	Acutely threatened
2	10 to 20 % indigenous vegetation left	Chronically threatened
3	20 – 30 % indigenous vegetation left	At Risk
4	> 30 % left and < 10% protected	Critically under protected
5	> 30 % left and 10 – 20 % protected	Under protected
6	> 30 % left and > 20 % protected	Less reduced and better protected

Source: Walker et.al. (2007): Threatened Environment Classification: Guide for Users (Ver1.1, August 2007)

A desktop assessment will determine the Land Environment and Threat Classification for the proposed Plan Change area.

One of the best known and most fundamental relationships in ecology is the species – area relationship. It is well understood that losses in habitat diversity and area will result in a reduction of species richness and abundance. Fragmentation of habitat can compound losses. Species and population viability is reduced as remaining habitat patches or fragments are

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removed due to the dysfunction of natural processes – dispersal, succession, adaptation and evolution. A pragmatic average for New Zealand suggests that species loss will accelerate sharply, due to loss of area alone, once less than about 20% of the original area remains.²

This assessment will determine whether the proposed plan change area supports significant indigenous vegetation and/ or significant habitat of indigenous fauna. It will further determine whether indigenous vegetation present (if any) is representative of the Land Environment(s).

2.4 The New Zealand Threat Classification system

The New Zealand Threat Classification system was updated in 2007 and until the threat classification lists are updated, they will refer to the 2002 threat classification system which includes acutely and chronically threatened groupings.

Acutely threatened

The 'acutely threatened' division has three sub-categories – 'nationally critical', 'nationally endangered' and 'nationally vulnerable'. (These equal the IUCN categories of 'critically endangered', 'endangered' and 'vulnerable'). Taxa (species) listed as 'acutely threatened' face a very high risk of extinction in the wild.

Chronically threatened

There are two sub-categories for 'chronically threatened' taxa – 'serious decline' and 'gradual decline'. Taxa listed in either sub-category also face extinction, but are buffered slightly by either a large total population or a slow decline rate.³

LENZ, TEC and the NZ Threat Classification lists allow us to assess the values found within the proposed Plan Change area to be assessed against the full range of remaining natural habitats and ecosystems which are the most vulnerable across the whole of New Zealand within similar environments.

A site visit will enable a determination to be made regarding whether vegetation communities present contain threatened species. A determination of significance follows.

2.5 The New Zealand Biodiversity Strategy

Goal 3 of the New Zealand Biodiversity Strategy released in 2000 sets out the visionary goal of halting the decline in New Zealand's indigenous biodiversity by 2020; the goal is stated as:

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments and do what else is necessary to maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.⁴

² Source: Walker et.al. (2007): Threatened Environment Classification: Guide for Users (Ver1.1, August 2007); Part 2, page 22

³ *ibid.* Section 6.1.1; page 23

⁴ New Zealand Biodiversity Strategy page page18 with a discussion of the goal provided on page 20 of the Strategy.

2.6 Partially Operative District Plan

Objectives and Policies for Nature Conservation Values described under Part 4.1.4 of the District Wide Issues within the Partially Operative District Plan (PODP) give effect to Sections 5, 6 and 7 of the Act.

In undertaking an assessment of the Three Parks North proposed Plan Change the writer was cognisant of the policies of this objective as they relate to intrinsic values associated with past and present ecosystems, landforms and geomorphological features and the extent to which the natural qualities of environment including habitat of indigenous fauna can be maintained and enhanced within the context of the proposal.

2.7 Standards NZ HB 44:2001 Subdivision for People and the Environment

The principles set out in this New Zealand Standard encourage consideration of opportunities for integrated and sustainable land use. The Standard supports an ethos of development that harmonises with the ecological and physical characteristics of a development site.

Recommendations provided as an outcome to this assessment are cognisant of the concepts and objectives contained within the Standard.

3.0 Methods of Assessment

The ecological values assessment was undertaken in three stages including field preparation, fieldwork and the assessment of data collected in the field.

3.1 Field Preparation

The preparation for the fieldwork included:

- Interpretation of aerial photographs to assess the landforms and likely vegetation communities;
- Identification of the Land Environment of New Zealand's (LENZ) Level IV unit and the New Zealand threat classification for the LENZ Level IV unit.
- Review of existing published and on-line ecological information relating to the environment, vegetation, habitats and fauna of the site and surrounding area.
- Review of the Three Parks Ecological Assessment prepared by Natural Solutions for Nature Ltd in October, 2006;

3.2 Field Work

The ecological survey was undertaken by consultant ecologist Dawn Palmer of Natural Solutions for Nature Ltd on the 4th June, 2010. The survey undertaken is described below.

A walkover survey targeted areas of the property containing undulating landforms considered to be likely to support remnant indigenous vegetation. Un-marked 1 metre squared plots were located within areas judged to be representative of the surrounding vegetation and landform.

The plots were photographed and their location recorded using a GPS. The species present were recorded along with an indication of their relative dominance within the plot. As a pattern of vegetation and ecological values was determined, a vehicle was used to gain access to portions of the property considered likely to contain variation from the pattern of values identified.

Two bird counts⁵ were undertaken involving listening and observing with both the naked eye and binoculars for periods of between 5 to 7 minutes. The species seen and heard within the plan change area and immediate surrounds were recorded.

The survey included ground searching for lizards and lizard sign as well as potential habitat.(i.e. presence/ absence of dry grassland, and/ or rocky niches).

3.3 Post Field Work

The plants identified during the survey were checked against the list of threatened and uncommon plants listed by de Lange *et al.* (2009) and weeds, Roy, *et. al.*(1998).

A determination of the ecological significance of the vegetation communities and habitats identified used the following process:

- Review species composition within the identified vegetation communities to assess degree of naturalness (refer section 2.2 to 2.4 above).
- Establishing whether the vegetation described was representative of vegetation associated with the Land Environment and indigenous communities described by Walker, Lee and Rogers (2003), refer also to section 2.3 above).
- Based on the ecological values identified, opportunities for the protection, maintenance and enhancement were evaluated.

⁵ Following the 5 minute bird count method outlined in Dawson and Bull (1975) and the Department of Conservation website - <http://www.doc.govt.nz/conservation/native-animals/birds/five-minute-bird-counts/the-standard-method/>

4.0 Description of values present

4.1 Landform, Soils, Climate - LENZ

4.1.1 Landform

The proposed Plan Change area is located upon two clearly legible landforms being:

- A melt water / abandoned river channel present along the eastern portion of the site west of Mount Iron and State Highway 84. It extends through the Three Parks Zone towards the Cardrona River. Its form has been affected by the formation of the disused airstrip.

And

- Undulations resulting from glacial till deposited at the terminal moraines and outwash gravels of the Q2 and Q4 glacial advances dating between 15,000 and 83,000 years old respectively (Turnbull, 2000)⁶. The former (markedly undulating terminal moraine deposits) being found over most of the site west of the abandoned river or melt water channel, refer to **Attachment 2** 'Site Survey of Lot 2 DP 304423'.

The undulating terrain extends into the Three Parks Zone to the south and the golf course to the north and north west.

The moraine deposits of the proposed Plan Change area are not identified within the New Zealand Geopreservation Inventory (Hayward and Kenny, 1998) as geologically important or vulnerable sites. However the author notes the landform as an interesting local example of moraine deposits the like of which are not preserved elsewhere within the District.

4.1.2 Soils

The soils reflect the geomorphological history of the site with shallow, sandy loams (Luggate/ Brown Earth soils) over the gently undulating, well drained river/ melt water channel and shallow, sandy to silty loams (Wanaka/ Grey Melanic soils) over the rolling and moderately well drained areas of till deposits. Both soil types are moderately fertile⁷. Refer to **Figure 2**. A summary of the landform, soils, climate and Land Environment is provided in **Table 2**

⁶ Page 46; Figure 31 in Turnbull (2000), shows the down-valley limits of ice advances with the site positioned between limits of the Q2 and Q4 advances. Geological Map 18 indicates the site is overlain by till in terminal moraines (Q4t) with associated outwash gravels. These deposits are considered by Turnbull (2000) to be 'well preserved' and 'weakly weathered'.

⁷ GrowOtago – soil maps : www.growotago.orc.govt.nz; accessed 10 June 2010.

Table 2 Summary of Landform – Soils – Climate – LENZ

<i>Geology and Landform</i>	<i>Soils</i>	<i>Climate</i>	<i>LENZ</i>
Moraine and Fluvial Outwash land type with gently undulating melt water/ abandoned river channel	Luggate/ brown earth soils - shallow, sandy loams, well drained and moderately fertile	Cool climate with moderate solar radiation and moderate vapour pressure deficits. These areas can be drought prone with high annual water deficits.	N.5.1.c
Moraine and Fluvial Outwash land type with rolling glacial moraine (gravel and till)	Wanaka/ grey melanic soils - shallow, sandy to silty loams, moderately well drained and moderately fertile	Annual growing degree days (10°C) 951 – 1000. Median annual rainfall is 615 -700 mm Median summer rainfall is 141 – 160 mm with 24 hour maximums (between January and March) as high as 45 -50 mm Median autumn, winter and spring rainfall is 161-180 mm First early and late frosts occur in mid April (11 th – 15 th) and 1mid October (18 th – 22 nd)	

Source: GrowOtago – www.growotago.org.govt.nz ; Lucas and Associates (1995); Leathwick et al. (2003) Land Environments of New Zealand page 126-129; Leathwick et al. (2002) Land Environments of New Zealand – Technical Guide page162.; <http://koordinates.com/>

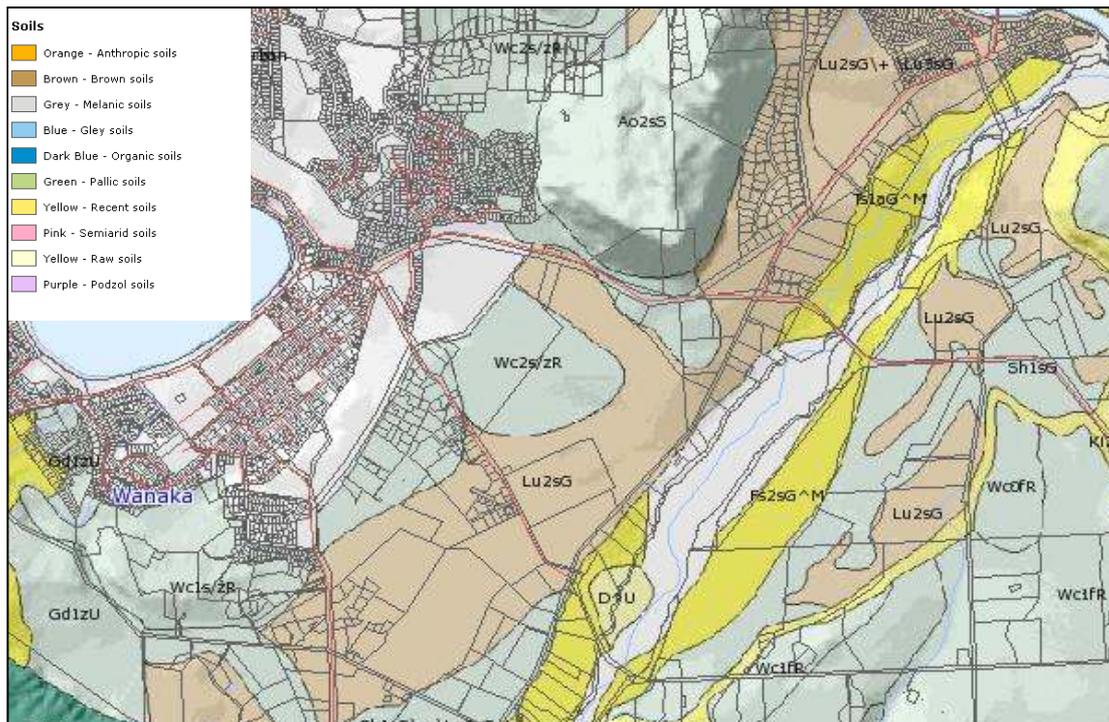


Figure 2: Soil map of Wanaka and the proposed Plan Change area.

Source: GrowOtago – www.growotago.orc.govt.nz - accessed: 1 June 2010

4.2 Current Vegetation

4.2.1 Pasture

The vegetation communities identified using the methods described in section 3 above, were uniformly bereft of natural values and were comprised of very poor pasture dominated by brown top (*Agrostis capillaris*) and sweet vernal (*Anthoxanthum odoratum*) which were present in lower laying areas between the moraine mounds. Viewed during the winter, the pasture was not in its most vigorous state and had been browsed to a short stubble. Broom (*Cytisus scoparius*) had been sprayed out along the Ballantyne Road boundary near waypoint 11 (refer to **Figure 3**) but remained along this boundary north of the power station near waypoint 15. Its spread is no doubt held in check by browsing pressure.

The raised and gravel strewn moraine mounds were densely infested with rabbits and the vegetation dominated by storks bill (*Erodium cicutarium*) and sheep sorrel (*Rumex acetosella*). Other species noted as minor components of the ground cover on the areas of raised ground were white clover (*Trifolium repens*), woolly mullein (*Verbascum thapsus*), orange hawkweed (*Hieracium aurantiacum*), mouse-ear hawkweed (*Hieracium pilosella*), bitter cress (*Cardamine hirsute*), yarrow (*Achillea millefolium*), hawkbit (*Leontodon taraxacoides*), St Johns wort (*Hypericum perforatum*), lichen and club moss. All but the latter two are exotic species.

A single indigenous shrub – a porcupine shrub (*Melicactus alpinus*) was noted at waypoint 22 near the boundary with the golf course.

A variety of garden shrubs surround the established residences.

Paddocks adjacent to the established residences were used as horse or sheep paddocks. Pastures in these areas were considered superior to those found over the balance of the site.

4.2.2 Shelterbelts and shade trees

Lombardy poplars (*Populus nigra* var. *italica*) have been planted outside and along the deer fence along Ballantyne Road. As they mature, they will provide visual screening between the adjacent industrial area and the proposed Plan Change area.

Mature Douglas fir (*Pseudotsuga menziesii*) shelter belts are well established along the northern boundary with the golf course, the boundaries with the Robertson/ Gordon - Moseby properties and along their boundary with SH84, west of Mount Iron.

A mature *Pinus radiata* shelterbelt is established along the southern boundary with the Three Parks zone.

Oak trees, larch trees, birch trees, macrocarpa, spruce, Eucalyptus species and Acacias have also been planted adjacent to established residences within the proposed Plan Change area.

Several of the Eucalypts were flowering at the time of the site visit providing a substantial attraction (nectar) for bellbirds.

Shade trees within the open paddocks are Eucalypts.



Figure 3: Location of waypoints
Source: MapToaster Topo F40B aerial photography 2002-2003

4.3 Fauna

While no deer were present at the time of the survey, the Ballantyne Investments Ltd property is deer fenced and it is understood the property has recently carried deer.

4.3.1. Lizards

Although the timing of this survey was not good for lizard detection, none were observed. The absence of well established grassland, short tussock grassland, shrubland or rocky habitats renders this site poorly suited to lizard fauna. Given the abundance of rabbits, the site is also likely to support a healthy feral cat and mustelid populations. This situation further reduces the potential for lizard populations to be sustained at the site, if present.

4.3.2 Rabbits

On two occasions rabbits were counted by panning across the site with binoculars. The first count recorded 71 rabbits with many running for cover as others re-emerged from burrows. The second count using the same method recorded 128. **Figure 4** and **4a** illustrate the extent of degradation resulting from the rabbit infestation on soil stability and ground cover.



Figure 4 (above): View north east from waypoint 21 of rabbit infestation;

Figure 4a (right): View south east from waypoint 17, pale patches of soil are visible at active rabbit burrows and warrens

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4.3.3. Avifauna

Bird species noted during the site visit are summarised in **Table 3**.

Table 3 Summary of species recorded during bird counts and noted during the site visit. (e = endemic; n= native; i = introduced)

Scientific Name	Common Name	Habitat
<i>Anthornis melanura</i> ^e	Bellbird	Eucalypts in flower
<i>Circus approximans</i> ⁿ	Harrier	Landed among rabbit warrens and soaring over site
<i>Emberiza citronella</i> ⁱ	yellowhammer	Shelterbelts, residential gardens and open paddocks
<i>Fringilla coelebs</i> ⁱ	Chaffinch	Shelterbelts and residential gardens
<i>Gymnorhina tibicen</i> ⁱ	White-backed magpie	Shelterbelts and pasture
<i>Passer domesticus</i> ⁱ	House sparrow	Shelterbelts, residential gardens and open paddocks
<i>Phipidura fuliginosa</i>	Fantail	Pinus radiata shelterbelt
<i>Sturnus vulgaris</i> ⁱ	Starlings	Pinus radiata shelterbelt
<i>Tadorna variegata</i> ^e	Paradise shelduck	Heard in adjacent Three Park zone
<i>Turdus merula</i> ⁱ	Blackbirds	Shelterbelts, residential gardens and open paddocks
<i>Varellus miles</i> ⁿ	Spur-winged plover	Open paddocks

The adjacent Three Parks zone was surveyed by Natural Solutions for Nature Ltd in October 2006. At that time a remnant wetland (a small patch of rushes) within the abandoned river or melt water channel adjacent to Riverbank Road was inhabited by paradise shelduck, pied stilt (*Himantopus himantopus*) and mallards which were no doubt also attracted to nearby the open water of the oxidation ponds (since removed). South Island Pied Oyster catchers (*Haematopus ostralegus*), skylarks (*Alauda arvensis*), and redpolls (*Carduelis flammea*) were also found on the adjacent site during the spring survey.

The habitat associated with the open pastures, and the damper conditions of the melt water channel extending from the proposed Plan Change area into the adjacent Three Parks zone may continue to attract seasonal migrants such as South Island Pied Oystercatchers but the proposed Plan Change area does not contain habitat likely to attract or help retain Pied stilts in the area.

Skylarks are species that nest in grassland, none where seen or heard during the site assessment but, like redpolls are likely to be present.

5.0 Significance of values present

5.1 District Plan

The Queenstown District Plan contains no records or listings of significant vegetation or significant habitat of indigenous fauna for the land affected by the proposed Plan Change.

5.2 Environmental Context

The proposed Plan Change is classified as an “N.5.1.c” Land Environment.

The N5.1.c environments of the surrounding area that have retained indigenous vegetation characteristic of this Land Environment include:

- the Hikuwai Conservation Area on the river flats and terraces on the true right of the Clutha;
- land on the escarpment at the northern end of Peninsula Bay zone;
- the Albert Town Flats and Hawea Terraces Conservation Areas located on the true left of the Hawea River at its confluence with the Clutha.

These areas variously support small stands or fragments of kanuka – matagouri shrubland with *Coprosma*, *Carmichaelia*, and fragments of open short tussock grasslands, associated herbfield and cushionfield species.

Historically, the vegetation of the proposed Plan Change area would have been a mosaic of open short tussock grasslands, herbfields and cushionfields, shrubland containing kanuka - Matagouri woodlands with *Coprosma*, *Olearia*, *Carmichaelia*, *Melicytus alpinus*, *Helichrysum*, *Myrsine divaricata* and *Muellerbeckia*. An occasional kowhai (*Sophora microphylla*) may also have been present. In the damper low laying areas or wetlands sedgeland would have been dominated by *Carex* species (Walker, Lee and Rogers, 2003; Leathwick, et.al., 2003, and Lucas 1995).

On a national scale, just 2.7 percent of the indigenous vegetation associated with N5.1.c environments remains⁸ and just 0.8 percent of that is protected. These environments are therefore considered to be “acutely threatened”. However, the proposed Plan Change site contains nothing of its former natural diversity. It is among the 97.3 percent of these Land Environments where, the indigenous vegetation and ecosystems they supported have been substantially lost. Locally, this includes much of the land within inter-montane basins and outwash plains.

⁸ Walker, S. LENZ Threatened Environments Classification, Copy of ThreatCategoriesVer3.xls downloaded 15 Jun 2010 <http://www.landcareresearch.co.nz/databases/lenz/downloads/ThreatCategoriesVer3.xls>

5.3 Significant Indigenous Vegetation

Threatened plant databases⁹ were reviewed for records in the vicinity of the proposed plan change. Photographs and habitat descriptions were checked on the New Zealand Plant Conservation Network website prior to undertaking the site visit. In particular the dryland button daisy (*Leptinella serrulata*), naturally uncommon, and New Zealand mousetail (*Myosurus novae-zelandiae*), a nationally critical, spring to summer-green annual, were of potential interest at this site.



Figure 5a: (left) dryland button daisy



Figure 5b: New Zealand mousetail

Source: NZ Plant Conservation Network, photographs by John Barkla

Given that the survey occurred in June, it is possible that NZ mousetail is present but was not visible. NZ mousetail has been found elsewhere in damp or saline hollows or as a turf species around ephemeral wetlands, on gravel flats and alluvium. Virtually all of its habitats are being invaded by taller, faster growing or turf forming perennial weeds, converted for intensive farming (e.g. dairy) and/ or altered by wetland drainage.

The dryland button daisy has been found in habitats such as dry inter-montane basins on open sandy ground amongst tussock grasslands. This species is declining due to the spread of Hieraceum and exotic pasture grasses¹⁰.

However, the extent of degradation (presence of perennial pasture weeds, browntop and dense pastures in low laying areas, browsing by deer and rabbits), and the near total absence of other indigenous cover suggests that the likelihood of threatened species being present is very low.

It is the author's view therefore that the vegetation at the site contains no values to recommend it as being significant. The site therefore contains no values that can be protected or maintained to give effect to National Priority number 1, the Priority that would have been most applicable to this site (refer Section 2.2 above).

⁹ with reference to an unpublished database of threatened plants, pers. comm.. John Barkla, botanist, Department of Conservation, November, 2009.

¹⁰ NZ Plant Conservation Network http://www.nzpcn.org.nz/flora_details.asp?ID=77

5.4 Significant Habitat of indigenous fauna

Avifauna present at the time of the site inspection were mostly exotic with the exception of bellbirds and fantails which were foraging in Eucalypts and shelter belts and paradise shelduck.

Paradise Shelduck may have a territory that includes the proposed Plan Change area. The area most suited for their nesting is between the airstrip and the escarpment west of the State Highway in the melt water channel west of the established residences of Robertson and Gordon. However their potential displacement from the site is of no more than minor consequence. Paradise shelduck are listed in Schedule 1 of the Wildlife Act, 1953 as a game species.

The absence of open water within the proposed Plan Change renders it unsuitable habitat for Pied Stilts.

Pied Oystercatchers are distributed almost world wide¹¹, they migrate to the braided rivers and open pastures of river terraces throughout the Queenstown Lakes District where they breed and rear chicks between August and December. The potential displacement of Pied Oystercatchers from this area, is not therefore considered significant for this species.

The value of any potentially available habitat for ground nesting species (waders, waterfowl, skylarks) in this area is severely compromised by the risk of predation or trampling. A rabbit infestation of the scale seen at this site is likely to support feral cat and mustelid populations.

The indigenous and native passerines (perching birds) found at the site are commonly associated with urban and residential areas as well as farmland, forest and shrubland.

No lizards or lizard sign was observed and the habitat was considered to be very poor due to the poor pasture and lack of ground cover such as short tussock grassland, shrubs and rocks for shelter¹².

It is the author's view therefore that the site does not currently provide significant habitat for indigenous fauna.

6.0 Actual or Potential effects on the Environment

6.1 Potentially Adverse Effects

The proposed Plan Change area does not support significant vegetation or significant habitat of indigenous fauna.

Potentially adverse effects of a zone change that provides for mixed density residential and retail development are therefore limited to the alteration of the undulating moraine landform and the melt water channel by cut and fill to accommodate roads and building platforms. These landforms provide the foundation for any reinstatement of indigenous character.

¹¹ Heather, B. and Robertson, H. (1996): The Field Guide to the Birds of New Zealand. Viking Press, Auckland, NZ

¹² Norbury, G., Heyward, R. and Parkes, J. (2009), page 30

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The undulating moraine landform and melt water channel are not recognised in any of the published reports reviewed as being of geological significance. However, it is the author's view that they contribute to the amenity and natural character of the site.

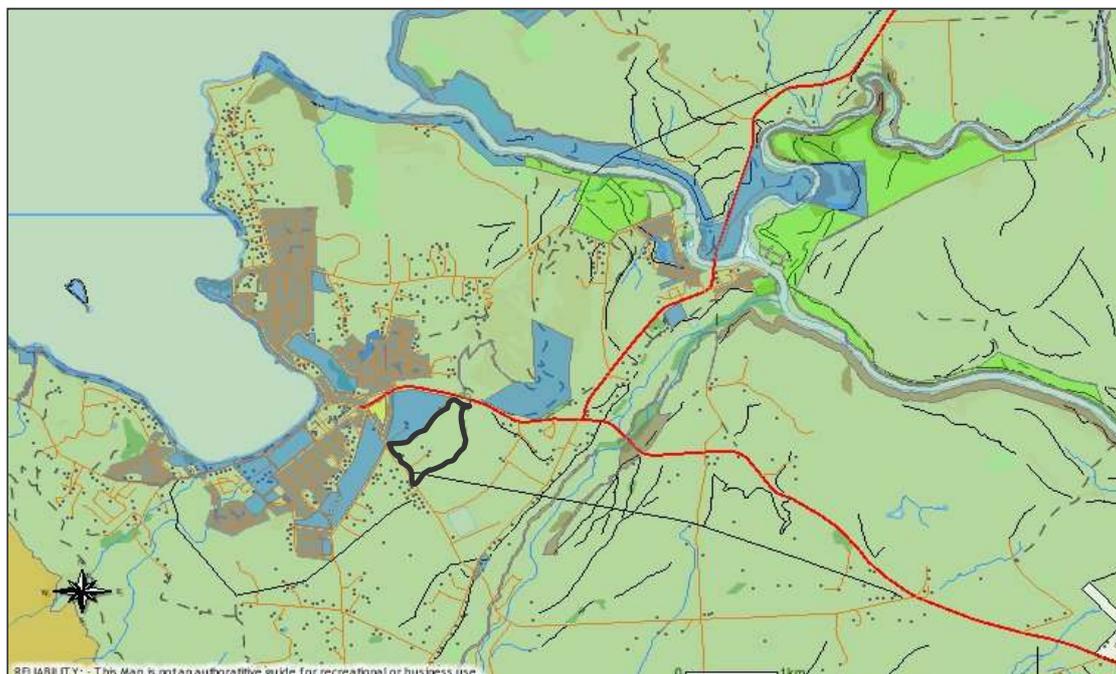


Figure 6: Network of surrounding public reserves and conservation areas in relation to the proposed Plan Change area. Areas shown in blue are reserves held under the Reserves Act. They are administered by either QLDC or DOC. Areas shown in darker green are Conservation Areas administered by DOC. Areas shown in taupe along the rivers are marginal strips. These are also administered by DOC.

6.2 Potentially Beneficial Effects

Given the level of ecological degradation and loss within the proposed Plan Change area there is a real opportunity to reinstate indigenous biodiversity within the context of the Plan Change. The inclusion of native plants into street side landscaping and open spaces will achieve this.

Residential gardens when combined with open space plantings, have the potential to substantially improve on the current state of the environment. At the very least they would achieve a visible presence of indigenous diversity and would potentially improve the ability of the site to support native fauna (within an urban setting). As plantings mature their value and attraction to “back yard” and local fauna populations within the surrounding reserves will improve¹³.

The site's proximity to other areas of open space and reserves such as the Mount Iron Scenic Reserve, environs of the Clutha River (refer to **Figure 6**), merits the establishment of linkages to or expansion of the surrounding network of reserves. The creation and/ or expansion of these corridors are likely to benefit invertebrate, lizard and bird populations currently inhabiting the more natural environs of Wanaka¹⁴.

¹³ Ignatieva, M., Meurk, C., van Roon, M., Simcock, R. and Stewart, G. (2008), sections 3.1 - 3.5

¹⁴ Meurk, C. and Hall, G.M.J. (2006): page 141

7.0 Summary and Recommendations for Mitigation and Enhancement

7.1 Significance

The proposed Plan Change area does not support significant vegetation or significant habitat of indigenous fauna. It does however encompass an interesting local landform being, an example of undulating, glacial moraine. The presence of this landform at this location is not noted within the literature cited as being of geological significance.

One can therefore conclude that the current condition of the land and ecological values present would not detract from or constrain the outcomes sought by the proposed Plan Change.

7.2 Opportunities for enhancement

1. The undulating moraine landform provides an opportunity to incorporate the diversity and natural character of the landform into the design and layout of the future subdivision and developed area.
2. The incorporation of indigenous vegetation into landscape designs for public spaces (including street design and open spaces) will reinstate indigenous biodiversity currently absent from the site. This will in turn improve support for local bird and potentially invertebrate and lizard populations as they recover and/ or migrate into the site along new green, open space corridors following their establishment.

7.3 Recommendations

1. It is recommended that the landscape design of the proposed Plan Change area and future subdivision seek to preserve at least in part the legibility of the undulating moraine landform at the site through its incorporation into a network of open spaces within the new zone.
2. It is strongly recommended that indigenous vegetation be used in the landscape designs of streets and open public spaces. Species recommended as ecologically appropriate for this area are provided as Table 4 in **Attachment 3**.
3. It is recommended that “green spaces” or corridors establish linkages for biodiversity and people between the site and the surrounding network of reserves and open spaces. In this way the small scale habitats established within the proposed Plan Change area may support and enhance the network within which it will fit, and in turn, provide reciprocal benefit.

The incorporation of these recommendations into the design of the proposed Plan Change would give effect to the objectives of Standards NZHB 44:2001 Subdivision for People and the Environment¹⁵ and concepts of ‘Low Impact Urban Design’ described by Ignatieva, M., et. al. (2008).

¹⁵ Standards NZHB 44:2001 – 2.6 Analysis and Concept Plan - Objectives 2.6.1; page 46; and 3.2 Integrating People and Places with the Landscape – Objectives 3.2.1; page 60.

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9.0 Attachments

- 1 Wanaka Structure Plan**
- 2 Extent of the proposed Plan Change area**
‘Site Survey of Lot 2 DP 304423’
- 3 Recommended plant species**

Attachment 1

Wanaka Structure Plan

Attachment 2

Extent of the Proposed Plan Change area

'Site Survey of Lot 2 DP 304423'

Attachment 3

Species recommended for ecological enhancement of open spaces

The following species are recommended as a guide for the reinstatement of indigenous plant diversity within the proposed Plan Change area.

Note: this list was based on but varies slightly from the one provided by Natural Solutions for Nature Ltd for the adjacent Willowridge land (Three Parks Zone).

Table 3: Species guide for the reinstatement of indigenous plant diversity

Botanical Name	Common Name	Swales / parks with permanent moisture/ detention ponds	Swales – dry summer	Street/ park trees	Gardens	Rain gardens
<i>Aristotelia fruticosa</i>	Mountain wineberry	*	*		*	
<i>Carex buchananii</i>						*
<i>Carex comans</i>		*	*			
<i>Carex secta</i>	Purei sedge	*				*
<i>Carmichaelia petriei</i>	Native broom	*	*		*	
<i>Coprosma ciliata</i>		*	*		*	
<i>Coprosma crassifolia</i>	Hairy Coprosma	*	*		*	
<i>Coprosma intertexta</i>		*	*		*	
<i>Coprosma propinqua</i>	Mingimingi	*	*		*	*
<i>Coprosma rugosa</i>		*			*	
<i>Coprosma tayloriae</i>		*	*		*	
<i>Coprosma virescens</i>			*		*	
<i>Cordyline australis</i>	Cabbage Trees	*	*		*	*
<i>Corokia cotoneaster</i>	Korokia	*	*			*
<i>Cortaderia richardii</i>	Toe toe	*			*	*
<i>Discaria toumatou</i>	Matagouri	*	*			
<i>Festuca novae-zelandiae</i>	Hard tussock				*	
<i>Griselinia littoralis</i>	Broadleaf	*			*	
<i>Hebe buchananii</i>			*		*	
<i>Hebe salicifolia</i>	Koromiko	*			*	
<i>Helichrysum lanceolatum</i>			*		*	
<i>Hoheria angustifolia</i>	Narrow leaved lacebark / houhere	*	*	*		

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Botanical Name	Common Name	Swales / parks with permanent moisture/ detention ponds	Swales – dry summer	Street/ park trees	Gardens	Rain gardens
<i>Juncus edgariae</i>	Native rush	*				
<i>Kunzea ericoides</i>	Kanuka		*	*	*	
<i>Leptospermum scoparium</i>	manuka	*	*			
<i>Libertia ixioides</i>	NZ iris				*	*
<i>Melicope simplex</i>	Poataniwha		*		*	
<i>Melicytus alpinus</i>	Porcupine shrub		*		*	
<i>Muehlenbeckia axillaris</i>	Creeping pohuehue		*		*	*
<i>Myrsine divaricata</i>	Weeping matipo	*	*		*	
<i>Olearia avicenniifolia</i>	mountain akeake				*	
<i>Olearia bullata</i>		*	*		*	
<i>Olearia fragrantissima</i>	Fragrant tree daisy	*			*	
<i>Olearia hectorii</i>	Hector's tree daisy	*		*		
<i>Olearia lineata</i>	Tree daisy	*			*	
<i>Olearia odorata</i>	Scented tree daisy	*			*	
<i>Ozothamnus leptophyllus</i>	tauhinu	*			*	*
<i>Phormium cookianum</i>	Mountain flax		*		*	
<i>Phormium tenax</i>	NZ Flax	*				*
<i>Phyllocladus alpinus</i>	Mountain toatoa	*			*	
<i>Pimelea aridula</i>			*		*	
<i>Pimelea oreophila</i>			*		*	
<i>Pittosporum tenuifolium</i>	Kohuhu	*	*			
<i>Plagianthus regius</i>	lowland ribbonwood	*	*	*	*	
<i>Poa cita</i>	Silver tussock				*	
<i>Poa colensoi</i>	blue tussock				*	

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Botanical Name	Common Name	Swales / parks with permanent moisture/ detention ponds	Swales – dry summer	Street/ park trees	Gardens	Rain gardens
<i>Podocarpus hallii</i>	Totara	*		*		
<i>Pseudopanax crassifolius</i>	lancewood	*		*		
<i>Pseudopanax ferox</i>	Fierce Lancewood				*	
<i>Rubus schmidelioides</i>					*	
<i>Sophora microphylla</i>	Kowhai	*	*	*	*	

Sources: personal knowledge; reference to Walker, Lee and Rogers (2003) – **shown in bold**; with reference to Ignatieva et al (2008) regarding areas to be planted