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Significant natural areas of the Waipa district: terrestrial and wetland ecosystems

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Waikato
REGIONAL COUNCIL
Te Kaunihera ā Rohe o Waikato

Significant Natural Areas of the Waipa District: Terrestrial and Wetland Ecosystems

Kessels & Associates Ltd
ECOLOGY AND ENVIRONMENTAL PLANNING

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Disclaimer

The "Provisional Significant Natural Areas of the Waipa District: Terrestrial and Wetland Ecosystems" data are derived from analysis and interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and limited field surveys. The data comprises an extensive yet provisional inventory and assessment of SNA of terrestrial and wetland ecosystems of the Waipa District. It is subject to revision through consultation with the Waipa District Council or other appropriate sources. Waikato Regional Council strongly advise that the data be used only in conjunction with subsequent field surveys, especially if the data will be used to help with decisions on resource consents, the development of district plan and regional plan schedules, or funding priorities. The data have been captured at scales of 1:10,000 or smaller and should not be used at greater scales (e.g. 1:5,000) without detailed field survey. The absence of an existing natural terrestrial or wetland ecosystem area from the "Significant Natural Areas of the Waipa District: Terrestrial and Wetland Ecosystems" data does not imply that such an area is not, or cannot be considered, a significant natural area, a significant area of indigenous vegetation or significant habitat for indigenous species. Such areas should be assessed when and if required.

Executive Summary

Project Brief

Waikato Regional Council (the Council) is undertaking a project to identify and prioritise areas of indigenous flora and fauna habitats within the Waikato Region for biodiversity management. In order to do so, features of existing habitats of indigenous flora and fauna (i.e. natural areas) are being described and assessed for their ecological significance. Currently, natural areas of terrestrial and wetland ecosystems are being identified, described and assessed for each local territorial authority within the Waikato Region.

This SNA project fulfils part of the Council's Resource Management Act 1991 (RMA) obligations to assess areas of significant indigenous vegetation and significant habitats of indigenous fauna within the Waikato Region. Separate SNA assessments have been conducted for riverine, lacustrine, geothermal, and karst ecosystems. This assessment forms the component of the terrestrial and wetland SNA that fall within the Waipa territorial authority area.

As part of this project Kessels & Associates have been commissioned to undertake a "desktop" exercise to identify and assess the significance of natural areas within the Waipa District using existing information on these areas.

This inventory includes an assessment of indigenous terrestrial and freshwater wetland natural areas. Natural areas of other ecosystem types (e.g. lakes, rivers and streams) are being assessed by Waikato Regional Council in other region-wide studies.

Summary of Methodology

The study area includes parts of seven mainland ecological districts (ED) within the Waipa territorial boundary (i.e. Raglan, Hamilton, Waipa, Kawhia, Maungatautari, Ranginui and Tokoroa) covering some 147,017 hectares (ha). The parts of EDs that lie outside the Waipa territorial boundary are covered in other SNA assessment studies. The EDs are subdivided based on geological, pedological, topographical and botanical features. Hamilton, Maungatautari and Waipa EDs make the largest contribution to the Waipa District, collectively representing 86 % (126,286 ha) of the total district (147,017 ha).

The location and extent of areas, or "sites", of indigenous terrestrial and freshwater wetland vegetation were determined primarily from Waikato Regional Council's Biodiversity Vegetation (BIOVEG) data, along with aerial photography captured in 2007. Other information used for identifying, describing and assessing sites included all available biological data sets, past reports and inventories, key protected areas (e.g. Department of Conservation (DOC) data, Queen Elizabeth II (QEII) Trust Open Space covenants, Waipa District Council Environmental Protection Lot covenants), Ecological District boundaries and flora/fauna species records. As part of this exercise, a data set of threatened flora and fauna species in the Waipa District was researched and prepared.

The design scale of both the BIOVEG and SNA data is 1:10,000. This means that the data has not been captured or edited at a scale greater than 1:10,000 and should not be interpreted beyond this scale.

For the purposes of this project the minimum mapping unit (MMU) was 0.5 ha, rounded to the nearest 0.1 ha. Areas of indigenous vegetation smaller than 0.5 ha were not mapped or assessed unless such areas were determined to have a significance level of at least "Regional".

To determine whether a site was significant it was assessed against the 11 criteria defined in the Waikato Regional Policy Statement (RPS). Generally, if a site met one or more of these criteria, it was considered a significant natural area (SNA), and was then assessed to determine a level of significance, i.e. "International", "National", "Regional", or "Local", as per guidelines developed by the Council and Wildland Consultants (Waikato Regional Council Technical Report No. 2002/15, 2002). Sites that were not found to be significant were classified into one of the following categories:

- "Likely" to be significant where the information available indicated the site has a high likelihood of meeting one or more of the 11 criteria, but this needs to be verified with more information, such as from field surveys;
- "Not significant" where, based on the information available, it was certain that the site did not meet any of the 11 criteria; or
- "Indeterminate" where there was insufficient information to determine if the site could meet any of the 11 criteria, or be classified in the "Likely" or "Not significant" categories. More information is needed for these sites, preferably from a field survey if possible.

Given this was largely a desktop study, an attribute called "Confidence Level" was used to indicate the amount of confidence in the accuracy of the significance assessment of a site. This was dependent upon the accuracy and availability of information about the site. In general, where reports of the site existed, or the site was personally known to staff, the confidence level was considered "high". Where the main vegetation type could be confidently determined, but other aspects such as health or species composition could not, the confidence level was considered "medium". Where the main vegetation type could not be confidently determined (e.g. indigenous vs. exotic scrub), or where indigenous subcanopy tiers could reasonably be expected to be present under an exotic canopy (e.g. willow wetlands) confidence levels were generally considered "low".

As part of the SNA assessment process, past records of threatened indigenous species were included. However, many species, such as NZ kaka and NZ falcon, are highly mobile and have large territories and vast home ranges. It is difficult to predict where these species may utilise suitable habitats throughout a year, so habitat utilisation is probably much broader than specific points in time and place as recorded on a database.

The key outputs of this project are this report and a GIS-based data set of all sites assessed, including attributes for the following:

1. spatial information, ownership and protection status of each site;
2. descriptions of key vegetation, ecosystem and habitat types, as well as significant flora and fauna species; and
3. assessments of the 11 criteria, level of significance and threats and opportunities for management (a complete list of attributes, including definitions, is provided in Appendix V of this report).
4. Land Environments of New Zealand (LENZ) is a national environment-based classification of ecosystems mapped across New Zealand's landscape. LENZ is a surrogate for the likely past (pre-human) pattern of terrestrial ecosystems and their associated biodiversity. One of the aims of this exercise was to protect indigenous vegetation associated with land environments, (defined by Land Environments of New Zealand at Level lV), that have 20 percent or less remaining in indigenous cover. This report summarises the data from the LENZ analysis for Waipa District.

Summary of Key Findings and Results

This survey confirms the fact that the extent and size of indigenous vegetation and habitats of indigenous fauna are severely under-represented within the Waipa District, with only 7.5 % of the Waipa District still containing indigenous vegetation. This compares poorly with many other Territorial Authorities within New Zealand, highlighted by the fact that only 0.29 % of New Zealand's Nationally Threatened Vegetation units are within Waipa (Walker et al, 2005). Primary forests (3.1 % of their original estimated extent) and wetlands (0.2 % of their original estimated extent) are particularly under-represented within the District (Leathwick *et al.*, 1995). Despite this, there are still prominent and ecologically significant natural features remaining within the Waipa District (Figure 1):

- the three bush clad peaks of Pirongia, Kakepuku and Maungatautari;
- the peat lakes of the central plains between Hamilton and Te Awamutu;
- The Waipa and Waikato Rivers; and

- The remnant restiad peat bog – Moanatuatua.

A summary of some of the key results of this study includes:

1. A total of 840 sites were assessed. 587 sites were identified as SNA, covering some 10,914 ha. 98 sites were considered likely to be significant, 80 sites were considered not significant as they did not contain any significant ecological values and therefore did not meet any of the 11 RPS criteria, and 75 sites remained with an indeterminate significance status, because the vegetation appeared severely degraded or it was impossible to determine the vegetation composition and other ecological values from the aerial photography or from any other available information, and a field check was recommended.
2. Of the 587 SNA identified, well over 70 % (431 sites) were considered to be significant at a "Local" level. However, these sites only cover 28 % of the area that was identified as significant, while the 19 sites of "National" significance cover 50 % of the area and 22 % of the area (137 sites) was significant at a "Regional" level.
3. 444 of significant sites, equating to 4,367 ha or 40 % of the area of SNA, are not protected under statute or covenant, i.e. unprotected (this includes both private and public land).
4. The main proportion of SNA (74 %) is comprised of indigenous forest followed by manuka and/or kanuka scrub (approximately 10 %).
5. While some SNA have low vegetation values and are comprised of weeds and animal pests, they can provide habitat for a diverse range of indigenous fauna, including important breeding habitat for nationally threatened species – notably long-tailed bats.
6. Scrubland and willow wetlands vegetation types are found primarily within unprotected private land. Scrubland and willow wetlands, can provide habitat for many threatened fauna species, such as long-tailed bats, lizards and black mudfish, as well as threatened wetland plants.
7. Only 104 ha (or 0.9 %) of the SNA area in the Waipa District was classified as "Herbaceous Freshwater Vegetation", and 60 % of these areas are found on unprotected private land.
8. A total of 73 nationally threatened species (24 flora species and 49 fauna species) have been recorded as being present within the Waipa District. While some of these species are found solely within Maungatautari Ecological Island, others are widespread throughout the district. Cryptic fauna species, such as the Hochstetter's frog and North Island long-tailed bats, are regularly being discovered in new sites and habitats with improved survey methods and technology as ecological investigations for resource consents or scientific research are conducted. The SNA database needs to be regularly updated to reflect this.
9. Walker *et al.* (2005) have calculated that 1,106 ha of the Waipa District contain indigenous habitat that is presently nationally threatened, and 1,989 ha of habitat within Waipa District is under-protected from a nation-wide perspective. These statistics highlight that nationally threatened vegetation types are under-represented and not well protected within Waipa District.

Conclusions and Recommendations

While this inventory has not assessed stream, river or lake ecosystems, many of the SNA do contain, or are adjacent to, freshwater ecosystems with significant ecological values. For example, the wetlands surrounding the peat lakes, while significant in their own right, also inter-relate with the functional and compositional values of the lake ecosystem itself. These linkages are very important for maintaining the lifecycles of many indigenous species, such as freshwater invertebrates, native fish and waterfowl.

The following list prov ides a summary of the habitat types, or "ecological hot spots" under the greatest threat for each ecological district (ED) in the Waipa District, and hence where the most scientifically appropriate opportunities for protection and restoration lie:

- Hamilton ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the lower slopes of Pirongia and the Kapamahunga Range.
  - ⇒ Gully wetlands, secondary growth forest and scrublands of the Waipa and Waikato Rivers and their tributaries.
  - ⇒ Any unprotected margins of peat lake or peat bog habitat, including pasture dominated buffer margins.
  - ⇒ Habitat for long-tailed bats.
- Waipa ED:
  - ⇒ Kahikatea dominated alluvial plain forest.
  - ⇒ Logged tawa and podocarp forest and kanuka scrubland on hill-slopes.
  - ⇒ Gully wetlands and scrublands along the Waipa River and its tributaries.
  - ⇒ Habitat for long-tailed bats.
- Maungatautari ED:
  - ⇒ Logged tawa and podocarp forest and kanuka scrubland surrounding the lower slopes of Maungatautari as well as in the vicinity of Te Miro and Whitehall and Buckland.
  - ⇒ The riparian margins scrublands, backwater wetlands and regenerating forest of the Waikato River and its tributaries.
- Kawhia ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the lower slopes of Pirongia.
  - ⇒ Gully wetlands and forest/scrublands along the tributaries of the Waipa River.
- Ranginui ED:
  - ⇒ Logged tawa and podocarp forest fragments.
  - ⇒ Scrub margins of the Waikato River, Puniu River and their tributaries.
- Raglan ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the slopes of the Kapamahunga Range.

This project is limited to the identification and assessment of areas of vegetation and habitats for indigenous fauna that are comprised primarily of indigenous vegetation and are over 0.5 ha in size. It is acknowledged that significant habitats for indigenous fauna do exist outside of areas of indigenous vegetation (e.g. long-tailed bats in exotic tree stands; black mudfish populations in highly modified drains and willow wetlands). It is also important to bear in mind those wetlands and terrestrial remnants under 0.5 ha which have not been mapped or assessed in this study. This does not imply that as yet to be identified areas, even those under 0.5 ha or exotic vegetation providing habitat for threatened species, are not significant. In some cases they may well be ecologically significant and trigger the RPS criteria. We recommend that the Council consider a future project to assess significant habitat for indigenous fauna in exotic vegetation. Also, it would add value to the database if the ecological significance of sites smaller than 0.5 ha or that have not been previously identified are assessed as they come to light.

1 Introduction

Waikato Regional Council (the Council) is undertaking a project to prioritise areas of the Waikato Region for biodiversity management. In order to do so, existing habitats of indigenous flora and fauna (i.e. natural areas) need to be identified, their features described and their ecological significance assessed. The identification and assessment of natural areas will assist both the Council and Waipa District Council (WPDC) to make decisions regarding policy development and the prioritisation of funding and resources for ecological restoration, as well as being an important information resource for the assessment of resource consents.

This SNA project fulfils part of the Council's Resource Management Act 1991 (RMA) obligations to assess areas of significant indigenous vegetation and significant habitats of indigenous fauna within the Waikato Region. Separate SNA assessments have been conducted for riverine, lacustrine, geothermal, and karst ecosystems. This assessment forms the component of the terrestrial and wetland SNA that fall within the Waipa territorial authority area.

WPDC is currently in the process of reviewing its district plan, and as such, Waikato Regional Council considered that undertaking an assessment of the natural features within the Waipa District was timely. As part of this project, Kessels & Associates, in conjunction with Red Admiral Ecology, have been commissioned to undertake a largely "desktop" exercise to identify, describe and assess the ecological significance of remaining natural areas of terrestrial and wetland habitats of indigenous flora and fauna in the Waipa District.

This report provides a summary of the methods and results of the "desktop" exercise, which was comprised primarily of a literature review, analysis of recent aerial photography and other data, and use of existing in-house knowledge of the Waipa District. The data resulting from this project is held and maintained in an SNA database at the Council. It is important to recognise that the inventory produced for this study is an indicative and provisional data set of SNA in the Waipa District as at 2007 (based on the year of capture of the aerial photography used as the primary source for determining site boundaries), and it is expected to be updated periodically as new information becomes available. In particular, community consultation and data obtained from field surveys will provide valuable information which could be used to validate the data.

Only predominantly indigenous terrestrial and freshwater wetland natural areas were assessed as part of this inventory. Lake, stream and riverine ecosystems were not specifically included in this assessment, although there were some overlaps with terrestrial and wetland ecosystems. Some comment on these other ecosystems has been made where it was considered appropriate.

2 Objectives

The primary objectives of this project were to identify and assess the ecological significance of the remaining natural areas within the Waipa District, and to provide the Council and WPDC with a foundation data set for prioritising biodiversity management needs. To help achieve these objectives, the Council has developed guidelines for assessing the ecological significance (Waikato Regional Council and Wildland Consultants, 2002) of natural areas based on the 11 criteria defined in Appendix 3 of the operative Waikato Regional Policy Statement (RPS).

The key outputs of this project are this report and a GIS-based data set of all sites assessed, including attributes for the following:

1. spatial information, ownership and protection status of each site;
2. descriptions of key vegetation, ecosystem and habitat types, as well as significant flora and fauna species; and
3. assessments of the 11 criteria, level of significance and threats and opportunities for management (a complete list of attributes, including definitions, is provided in Appendix V of this report).

3 Methodology

3.1 General Approach

The site identification and significance assessments were carried out through a "desktop" exercise, with no detailed field work undertaken. The assessments were conducted using orthorectified aerial photography captured in 2007, existing ecological information sourced from reports and databases, and the local knowledge of Kessels & Associates staff. The resulting data from this assessment is held and maintained by Waikato Regional Council and forms part of a database of SNA for the whole of the Waikato Region.

The methodology applied for this project consisted of the following four stages:

3.2 Stage One - Literature Review

A comprehensive review of available existing information was undertaken to determine the ecological characteristics of the Waipa District. All key documents, databases and maps were reviewed to enable a gap analysis to be undertaken of where further information was needed. This included searching both electronic and paper sources together with the personal observations of project staff and employees of other ecological organisations. The list of primary sources of information used for the literature review is provided in Appendix I of this report.

3.3 Stage Two - Delineating Site Extent (Spatial Data) & Data Set Formation

A GIS project was established with spatial data from the Council's BIOVEG database utilised to establish preliminary site boundaries. Orthorectified aerial photography and Land Information New Zealand (LINZ) Topographic spatial data were used as the key tools for establishing vegetation coverage and site location.

Numerous additional data sets were added to provide an ecological context and a basis for individual site assessments. Key data sets included: territorial boundaries, legal protection boundaries (e.g. DOC, QEII, and district council covenants), Ecological District boundaries, animal pest control zones, and point locations of recorded flora/fauna species observations.

A data set of threatened flora and fauna species was researched and prepared, and was used in the assessment of significance of sites, which is detailed in section 5 of this report.

An Excel spreadsheet (hereafter Master Data) was completed to collate site description and significance assessment information (a complete list of attributes is provided in Appendix V of this report).

Guidelines for delineating sites were formulated by Waikato Regional Council staff and identified as "Specifications 1: Spatial data and GIS processing" (pages 17-19 of DOC #1646740). These specifications formed the basis for the creation of the spatial data, the main elements of which are listed below:

3.3.1 Base spatial data

The foundation for defining the spatial extent of sites was primarily generated from the Council's Biodiversity Vegetation (BIOVEG) data, and also included spatial data of land protected under statute or covenant (e.g. DOC Conservation Estate, WPDC reserves, QEII Trust Open Space covenants, WPDC Environmental Protection Lot covenants), and parcels under public administration, but not necessarily protected. Kessels & Associates reviewed and suggested revisions where applicable to the line work and classification of vegetation in the BIOVEG data using the 2007 WRAPS[1] aerial photography. Given the point in time nature of the BIOVEG and SNA data, the spatial data resulting from this project must be regarded as an indicative and provisional, "point in time" data set representing the state of indigenous terrestrial vegetation and wetlands of the Waipa District as at 2007.

[1] Waikato Regional Aerial Photography Syndicate

3.3.2 Design scale

The design scale of both the BIOVEG and SNA data is 1:10,000. This means that the data has not been captured or edited at a scale greater than 1:10,000 and should not be interpreted beyond this scale.

3.3.3 Minimum mapping unit (MMU)

For the purposes of this project the MMU was 0.5 ha, rounded to the nearest 0.1 ha. Areas of indigenous vegetation smaller than 0.5 ha were not mapped or assessed unless such areas were determined to have a significance level of at least "Regional".

3.3.4 Grouping or merging polygons (except for Maungatautari Ecological Island)

Two or more polygons were grouped or merged together as one SNA if all three of the following conditions were met:

i. the polygons to be grouped were all under the same type of administration (e.g. all DOC or all private land) and were all subject to the same protection status (e.g. all legally protected or all unprotected);

ii. the polygons to be grouped all consisted of the same primary ecosystem type (e.g. terrestrial, wetland or multiple) unless there was a clear and justifiable reason for grouping polygons consisting of different primary ecosystem types;

iii. each of the individual polygons to be grouped was required to be 0.5 ha in area or greater, meeting the MMU described above, as opposed to just the total area of the grouped sites exceeding 0.5 ha.

Additional factors, also considered in whether to group polygons as one SNA site, included:

i. Whether a clear biogeographical and/or ecological relationship existed, (e.g. whether the polygons to be grouped were all in the same valley or watershed, or were all closely associated with a reserve or other protected SNA of the same primary ecosystem type);

ii. Whether the polygons to be grouped were similar in size or shape, especially if the individual components were relatively distant from each other (e.g. over 1 km);

iii. Whether one polygon may have a different significance level than the other polygons to be grouped (e.g. if one of the polygons has a record for a threatened species, but the others do not).

3.3.5 Grouping or merging polygons (Maungatautari Ecological Island only)

The Maungatautari Ecological Island SNA was treated as a special case, with the boundary of this SNA derived from the boundary of the predator-resistant fence that surrounds Maungatautari. There is a mixture of publicly protected and privately owned land within the pest-proof fenced area. Land within the fenced area has been grouped to differentiate between privately owned land (legally protected – i.e. covenant), and not legally protected – (i.e. no legal protection on the title), and publically owned land. Therefore, while this SNA includes some parcels of land that are public and legally protected, as well as parcels that are privately owned land and not legally protected, it has been split into three sub-categories to show the different ownerships: legally protected scenic reserve inside the fence; legally protected QEII covenants inside the fence; and legally unprotected land inside the fence. In addition, the Maungatautari Ecological Island SNA includes small areas of pasture or other exotic vegetation that is assumed to be gradually converting to indigenous vegetation over time, but has been included as it provides significant habitat for fauna within the fence, such as takahe.

3.4 Stage 3 - Ecological Significance Assessment (Attribute data)

The assessment of the significance of sites was undertaken, with relevant attributes in the Master Data completed. The site assessment also included a review of the site boundaries, with recommendations for changes made where appropriate.

It should be noted that a large amount of information is held by the QEII National Trust in their database. However, the Trust has a policy of maintaining the privacy of information held about

covenants on private property. Therefore any information about a QEII covenant was gained only where it was available from other information sources.

Analysis of the indigenous vegetation and fauna characteristics of the Waipa District was undertaken with respect to the relevant provisions of the RMA and, in particular, the ecological significance assessment criteria of the Waikato RPS. The ecological significance of sites was initially assessed using Waikato Regional Council's guidelines for applying the 11 RPS criteria (listed in Appendix II of this report).

The assessment framework is based on quantitative and qualitative parameters that were established to make prioritisation systematic and explicit in the justification of a baseline for biodiversity monitoring with community outcomes in the Waikato Region.

3.4.1 Descriptive attributes

A number of descriptive fields were completed to provide background information relevant to each site. These fields include: a site name, a brief site description, the administration (i.e. tenure) and legal protection status, the broad ecosystem type, the ecological district(s) and bioclimatic zone(s) the site overlaps, the historic and current vegetation types (based on underlying spatial data) the site overlaps, and details of any significant flora/fauna species recorded from the site or considered likely to be present (more information of these and other attributes are described in Appendix V of this report).

3.4.2 Significance assessments

To determine whether a site was significant, it was assessed against the 11 significance criteria defined in Appendix 3 of the operative RPS. For each criterion, each site was assessed as either:

- meeting the criterion ("Yes");
- being likely to meet the criterion ("Likely");
- being uncertain as to whether the criterion was met or likely to be met due to inadequate information ("Indeterminate");
- or not meeting the criterion ("No").

In line with the project specifications, the assessment of each criterion followed Table 1 of the criteria assessment guidelines (Appendix II of this report), with the exception of criterion 3 for threatened and/or endemic species (see sub-section 3.4.2.2 below).

If a site was found to be significant, then it was further assessed to determine a level of significance, i.e. "International", "National", "Regional", or "Local", following Table 2 of the Council's guidelines (also provided in Appendix II of this report). Sites that were not found to be significant were classified into one of the following categories:

- "Likely" to be significant where the information available indicated the site has a high likelihood of meeting one or more of the 11 criteria, but this needs to be verified with more information, such as from field surveys;
- "Not significant" where, based on the information available, it was certain that the site did not meet any of the 11 criteria; or
- "Indeterminate" where there was insufficient information to determine if the site could meet any of the 11 criteria, or be classified in the "Likely" or "Not significant" categories. More information is needed for these sites, preferably from a field survey if possible.

3.4.2.1 RPS criterion 1 – "Protected sites"

The interpretation of RPS criterion 1 produced some debate during the assessment process. The assessment guidelines (Appendix II) explain that the assumption inherent in this criterion is that sites protected for their indigenous biodiversity values have been previously assessed in order to qualify for protection, and as such can be automatically considered significant (and significant at a minimum level of "Regional" according to Table 2 of the guidelines). The flaw in this assumption is that it is often difficult to confirm whether sites were originally protected for their biodiversity values. Both QEII and WPDC covenants allow for protection for values other than biodiversity (e.g.

historic), and DOC or other public land may be protected for landscape, recreation or other amenity or utility values. It is recommended that Waikato Regional Council undertake a full review of this criterion as part of the Regional Policy Statement review process.

For the purposes of assessing sites against this criterion, a review of the different types of legal protection was undertaken to produce a list of those with a reasonable expectation of being originally protecting the biodiversity values of a site (this list is provided in Appendix III of this report). Any sites with a legal protection type from this list were considered to meet criterion 1, while sites protected under other arrangements were scored as "indeterminate" for this criterion. In line with Table 2 of the guidelines, all sites considered to meet criterion 1 were assessed as having a significance level of at least "Regional".

3.4.2.2 RPS criterion 3 – "Threatened and/or endemic species"

Previous SNA assessments identified that changes to the significance assessment guidelines in relation to criterion 3 were required in order to provide a more robust and current assessment, particularly in light of recent changes in the national threat status classifications of some taxa of threatened species.

New threat status classifications were outlined in Townsend *et al.* (2008), and since that publication, revisions of the threat status of New Zealand taxa have adopted this new system. As of March 2011, many taxa have now been reassessed using the new system: birds (Miskelly *et al.*, 2008), plants (de Lange *et al.,* 2009), fish (Allibone *et al.,* 2009), herpetofauna (Hitchmough *et al.*, 2010), bats (O'Donnell *et al.*, 2010); and these new classification levels were adopted for this project.

Other taxa, where threat status revisions have not yet been published (e.g. invertebrates), follow the existing threat classifications (Hitchmough *et al.*, 2007) based on the previous system (Molloy *et al.,* 2002).

In light of the constant revision of threat status classifications, Waikato Regional Council, in consultation with Wildland Consultants and Kessels & Associates, has formulated updated guidelines for the assessment of RPS criterion 3. The full guidelines are provided in Appendix II; however, the key aspects are included below:

Table 1: Overall significance

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- *classed as 'Threatened' or 'At Risk' in New Zealand Threat Classification System, or*
- *classed as 'Data Deficient' in New Zealand Threat Classification System, or*
- *endemic to the Waikato Region.*

Or

It is habitat of importance for the conservation of a regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region.

Table 2 - Internationally Significant

It is habitat for an indigenous species (or genetically distinct population) threatened with extinction (in the categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable') and is endemic to the Waikato Region.

Or

It is a key habitat for the completion of the life cycle of species (or genetically distinct population) that migrate internationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

For a site to meet the criterion for international significance it must comprise significant habitat for a species (or genetically distinct population) on an international basis. This may include key sites for sustaining populations of international migrants. It must also provide

natural habitat (see natural habitat definition below) for the species (or genetically distinct population), and/or the genetic entity must be indigenous to the site.

Table 2 - Nationally Significant

It is habitat used on a regular basis by an indigenous species (or genetically distinct population) in the threat categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable'.

Or

It is one of the best quality examples, on a national basis, of habitats used on an ongoing basis by a species (or genetically distinct population) in the At Risk category in the New Zealand Threat Classification System (specifically 'Declining', 'Recovering', 'Relict', or 'Naturally Uncommon')[2].

Or

It is a key habitat for the completion of the life cycle of a species (or genetically distinct population), in one of the threat categories above, that migrate nationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions (and are unlikely to be important for the long-term viability of the species) do not meet this criterion. For a site to meet this criterion for national significance, it will be of importance for the viability of the species (or genetically distinct population) on a national basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site.

Table 2 - Regionally Significant

It is habitat of considerable importance for the conservation of an indigenous species (or genetically distinct population) in the 'At Risk' ('Declining', 'Recovering', 'Relict', and 'Naturally Uncommon') category, or is important habitat for a species that is endemic to the Waikato Region[3].

Or

It is habitat of importance for the conservation of regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region, although the species is secure elsewhere. Assessment of whether a species is classified as at risk or threatened in the Waikato Region would have to be justified by several well qualified and experienced ecologists familiar with the species and ecology of the Waikato Region.

Or

Habitat considered (by several qualified and experienced ecologists) to be of importance for the sustainability of a 'data-deficient' species on a regional basis.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions and it is unlikely to be important for long-term viability of the species (or genetically distinct population) do not meet this criterion. For a site to meet this criterion for regional significance, the site will be of importance for the viability of a particular species (or genetically distinct population) on a regional basis. The site will provide natural habitat for the species (or genetically distinct

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[2] Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al*., 2007), based on the Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the best quality examples, on a national basis, of habitats used on a regular basis by a species in the 'Serious Decline' or 'Gradual Decline' categories of the Molloy *et al.* (2002) system.

[3] Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al*., 2007), based on Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the 'Sparse' or 'Range Restricted' categories of the Molloy *et al.* (2002) system.

population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site. Small populations of threatened plants, not significant on a national basis, but in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, may be placed in this category.

Table 2 - Locally Significant

Data Deficient species will now trigger Criterion 3 in Table 1, therefore some sites, other than those that qualify as being regionally significant (see above), may now be locally significant as a result of providing habitat for Data Deficient species. Otherwise, no changes are necessary for the text of Table 2.

A further interpretation was adopted for "Regional" significance to include habitat for fauna species in the threat categories "Nationally Critical", "Nationally Endangered", or "Nationally Vulnerable", where the association with the site is not considered sufficient to meet national significance. This interpretation brings non-regular habitat for these threatened fauna species in line with sites of lower significance for flora species of the same threat status that are incorporated in the requirements for "Regional" significance.

No current assessments are known to exist for regionally threatened, or regionally at risk species, within the Waikato Region. In the absence of these classifications, a precautionary approach was taken to attempt to capture data relating to species that could reasonably be considered as "regionally rare". The list of these species is detailed in section 5. The regional rarity of species was supported with literature references where available, and for species where such references were not available, the species was recorded in the data set as "regionally rare tbc" (tbc meaning "to be confirmed").

It is also important to note that in some cases threatened species records include locations outside of indigenous vegetation areas, for example long-tailed bat and black mudfish (*Neochanna diversus*) records. These threatened species habitats were not assessed as part of this project, but it is recommended that a future SNA assessment should target these habitats.

Where threatened species records are present in an SNA site, the polygon based nature of this project may give the impression that the threatened species may be present throughout the SNA. Some threatened species, however, may have limited home ranges or specific habitat requirements that may restrict them to certain areas of an SNA. For example, a skink may only use rocky outcrops. Physical barriers to movement may also restrict species to a partial use of an SNA; the most obvious example being the flightless North Island brown kiwi (*Apteryx mantelli*) and takahe (*Porphyrio hochstetteri*) restricted to enclosures on Maungatautari Ecological Island.

3.5 Stage 4 - Quality Control

Draft versions of the data set were internally reviewed by Kessels & Associates staff and further reviewed by Council staff, who provided feedback and recommended revisions.

3.6 Data Set Accuracy

3.6.1 Positional Accuracy

The accuracy of the spatial boundaries of the sites in the data set is dependent on the data from which the boundaries are derived. In general, the positional accuracy can be considered to be within /- 30 m, which is the level of accuracy of the BIOVEG data, the primary source from which the majority of site boundaries were derived. The following is a list of the spatial data sets used to derive the spatial boundaries of all sites assessed in this project:

- Aerial Photography – WRAPS 2007 - GIS Layer (DOC# 1410510)
- Biodiversity Vegetation (BIOVEG) 2007 – GIS Layer (DOC# 1652753)
- DOC Conservation Boundaries (DOC# 881142)

- QEII National Trust covenants – GIS Layer (DOC# 881117)
- Waipa District Council Reserves (as of April 2010)
- Waipa District Council Environmental Protection Lot covenants GIS Layer (as of April 2010)

3.6.2 Attribute Accuracy

The accuracy of some of the attributes is also dependent on the accuracy of the data sets they were derived from. For example, the protection status of an SNA depended upon the accuracy of the QEII, DOC conservation land, and WPDC Reserves and Environmental Protection Lot Covenants data sets. Furthermore, presence of threatened species within a site, which were likely to contribute to overall significance levels, relied on the positional accuracy and correct identification in the original records.

The interpretation of vegetation types for this project was primarily based on the accuracy of the Council's BIOVEG data set and the 2007 WRAPS. However, further information was often available from existing literature and reports, together with the ecological knowledge of the area by Kessels & Associates staff. Since this was primarily a "desktop" exercise, very few of the sites have been surveyed in the field and little is confirmed of their composition other than that derived from limited, and often outdated data, along with interpretation of orthorectified aerial photography.

An attribute called "Confidence Level" was used to indicate the amount of confidence in the accuracy of the significance assessment of a site. This was dependent upon the accuracy and availability of information about the site. In general, where reports of the site existed, or the site was personally known to staff, the confidence level was considered "high". Where the main vegetation type could be confidently determined, but other aspects such as health or species composition could not, the confidence level was considered "medium". Where the main vegetation type could not be confidently determined (e.g. indigenous vs. exotic scrub), or where indigenous subcanopy tiers could reasonably be expected to be present under an exotic canopy (e.g. willow wetlands) confidence levels were generally considered "low". This attribute is particularly useful when prioritising sites for further field surveys, where those sites with "high" confidence rankings should be considered lowest in priority for field checks. A full description of confidence levels is provided in Appendix IV of this report.

3.6.3 Field Surveys & 'Slither' Errors

As stated in section 3.6.2 above, it is acknowledged that most sites have not been field checked. Further work is also required to pin-point remaining slithers (polygon lines which transgress into non-SNA areas) due to small inaccuracies in the underlying datasets or fractional discrepancies between aerial maps and property boundaries. During the Waipa District Plan consultation process, errors and minor inaccuracies (including slithers) were found and rectified in the base dataset by two processes. Firstly, a desktop review of over a hundred SNA sites was undertaken whereby the sites were checked in comparison to recent Google Earth imagery. This allowed for the determination and correction of errors in mapping and vegetation typing. Secondly, feedback arising from submissions (which are continuing as this report is finalised) to the Waipa District Council was taken into account in conjunction with the authors of this report visiting and carrying out field inspections for a total of 88 SNA sites where owners had concerns. As a result of this desktop review and landowner feedback process a number of these re-checked SNAs were altered and updated in terms of the spatial extent of the affected SNA and/or the ecological values found within them.

4 Ecological Character of the Waipa District

4.1 General Overview

The Waipa District lies within the heart of the Waikato Ecological Region (refer to Figures 1 & 2). Wildland Consultants (2007) provide a useful detail of the ecological context of the Waipa District, and an overview, which is summarised as follows:

"*Waipa District lies across three Ecological regions (ER) and six Ecological Districts (ED). No EDs are entirely contained within Waipa District. In the west, Tainui ER contains Raglan ED and Kawhia ED. In the south-east, Western Volcanic Plateau ER contains Ranginui ED and Tokoroa ED. Waikato ER contains Waipa ED, Hamilton ED and Maungatautari ED.*

The estimated 1840 vegetation cover of Waipa District was c. 45 % primary indigenous forest, c. 43 % secondary indigenous forest and scrub, and c. 11 % wetlands (Leathwick et al., 1995)".

The EDs are subdivided based on geological, pedological, topographical and botanical features. Hamilton, Maungatautari and Waipa EDs make the largest contribution to the Waipa District, collectively representing 86 % (126,286 ha) of the total district (147,017 ha).

Much of Waipa District comprises flat and easy hill country, with fertile soils, which have been developed for agriculture (Figure 2). Clearance of native forest and the draining of peat bogs in these lower lying areas have been extensive, resulting in minimal indigenous habitat remaining in these areas. However, small remnants of indigenous forest do persist, e.g. of particular note are small remnant stands of severely depleted kahikatea forest on the alluvial plains. Nationally significant peat lakes and associated wetlands are another important remnant feature of the district. A small part in the north-west of the Waipa District also contains areas of calcareous or limestone bedrock ecosystem types that are considered historically rare, such as calcareous cliffs, scarps and tors; cave entrances; caves and cracks in karst; and sinkholes (Ministry for the Environment and Department of Conservation, 2007; Williams *et al.,* 2007). These systems form when water channels and cuts through the limestone, forming an underground cave system.

The larger areas of indigenous habitat in the Waipa District are focused around the volcanic cones of Maungatautari and Pirongia. These areas provide large continuous tracts of predominantly lowland broadleaf-podocarp forest, although much of the original podocarp component was removed by logging early in the last century. From these two volcanic cones, smaller remnants of lowland forest extend along other elevated ranges to provide important linkages between forested areas within and outside of the Waipa District.

Despite the severe depletion of indigenous habitat in the Waipa District, many threatened species, including plants, birds, reptiles, amphibians, bats, fish and invertebrates, still inhabit this area. However, the future of many of these species, within the Waipa District, remains at risk, with continued habitat loss and predation from pest animals being a continuing threat.

The recent fencing, pest eradication and native species reintroductions at Maungatautari Ecological Island have resulted in a high public profile for this reserve in recent years; although the larger overall size of Pirongia Forest Park, combined with an active pest management programme, also makes this area highly significant within the district. Numerous other conservation programmes, government and community driven, are also being conducted throughout the district.

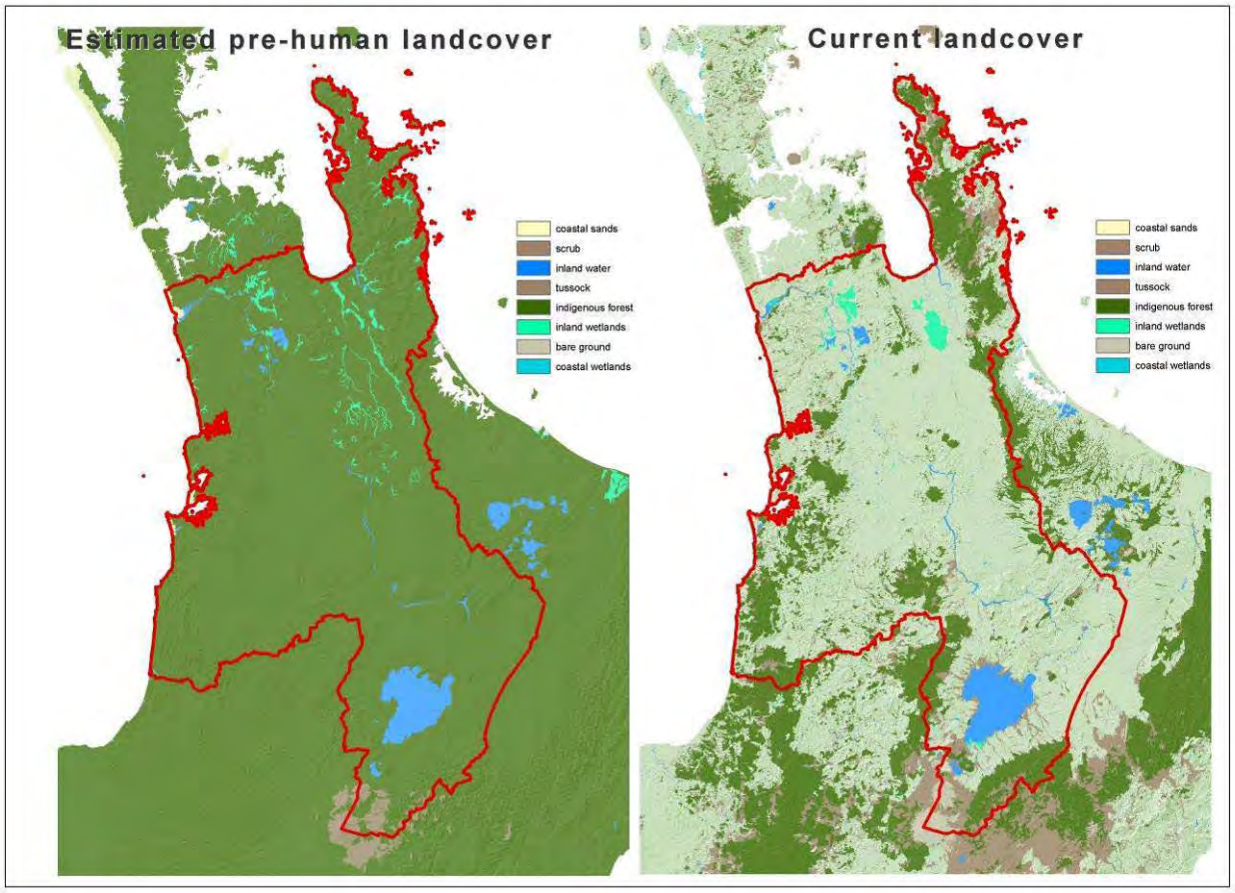

Figure1 Changes in landcover within the Waikato Region (Map sourced from Waipa District Council).

4.2 Raglan Ecological District

4.2.1 Overview

The Raglan ED covers an area of 133,261 ha (Leathwick *et al.,* 1995) and is located along the west coast from the Raglan Harbour north to the mouth of the Waikato River. Most of this ED sits within the Waikato District. Only 1,767 ha of the south-eastern edge is contained within the Waipa District and extends to the Kapamahunga Range.

4.2.2 Bioclimatic zones

The Raglan ED falls within the semi-coastal and lowland bioclimatic zones. The western, coastal reaches of the Raglan ED is dominated by the prevailing westerly wind. This is evident in the growth of trees and scrub in exposed areas. Summers are usually warm and humid with regular periods of drought in February and March. Winters are often mild with winds tending west and north-west. Average annual rainfall at Raglan between 1984 and 2004 was 1,354 mm (Swales *et al.,* 2005).

4.2.3 Geology and soils

The geology and soil within the Raglan ED are influenced largely by its proximity to the coast and rich volcanic history. The lowland ranges of the area are dominated by marine siltstone, mudstone and conglomerate formed during the Jurassic era. Steeper bluffs found alongside valleys are formed from Miocene and Oligocene sandstone, siltstone and limestone. In the coastal, more estuarine regions, calcareous mudstone and muddy sandstones form the upper catchments of the Raglan harbour (Swales *et al.,* 2005).

The small section of the Raglan ED, contained within the larger Waipa District consists mainly of central yellow-brown loams over rhyolite and sandstone near the eastern boundary. Further to the west, yellow-brown earths are derived from greywacke (Wildland Consultants,

2007). A notable feature is the presence of the uncommon Dunmore soil type (DOC BioWeb, 2010).

4.2.4 Vegetation

Historically, the Raglan ED was covered mostly in kauri-taraire-podocarp-broadleaved forest in the northwest and kauri-podocarp-broadleaved forest dominated the northeast area. Rimu-tawa forest was characteristic in the southern reaches, with areas of rimu-taraire-tawa forest, and dense podocarp forest in low altitude alluvial sites. In 1840, the area around Raglan was relatively isolated, so intensive deforestation did not occur in the area until 1879 when the first Waipa-Raglan road was completed (Swales *et al.*, 2005). A summary of vegetation cover for the Raglan ED in 1995 (Leathwick *et al.,* 1995) shows that only 13.3% of forest (primary, secondary and cutover), 53.3 % of freshwater and wetland habitat remain with only 0.1% being wetland. There is an increase from the original extent of secondary scrub/shrubland to 2,280 ha, which is nearly three times (287.1 %) the original cover.

The south-eastern edge, which falls within the Waipa District, is currently a mixture of farmed pasture, indigenous and exotic forest but once would have been kauri-podocarp-broadleaved forest on the hills and stands of kahikatea in the flat, flood prone areas. This small corner of the Raglan ED is partially protected, and has numerous tributary streams that form part of the Waipa River catchment.

4.2.5 Flora

The threatened king fern (*Ptisana salicina*) and thismia (*Thismia rodwayi*) are present in the Raglan ED but there are currently no records of these species being present in the small section within the Waipa District.

4.2.6 Fauna

Threatened species have been observed within the south-eastern corner of the Raglan ED including the nationally vulnerable North Island long-tailed bat (*Chalinolobus tuberculatus*) and New Zealand Bush falcon (*Falco novaeseelandiae*). This area is considered likely habitat for North Island kaka (*Nestor meridionalis*). These three species are considered very mobile and often have wide feeding and home ranges. There are also records of ornate skink (*Cyclodina ornata*) currently classified as under “Gradual Decline” (Hitchmough *et al.,* 2009) present just within the Waipa District boundary.

A search of the NIWA New Zealand Freshwater Fish database (NZFFD, 2010) showed the presence of common indigenous species such as shortfin eel (*Anguilla australis*), common bully (*Gobiomorphus cotidianus*) and Cran’s bully (*Gobiomorphus basalis*), as well as exotic species such as brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) in the Waikoha and Kaniwhaniwha Stream catchment. Torrentfish (*Cheimarrichthys fosteri*), inanga (*Galaxias maculatus*), longfin eel (*Anguilla dieffenbachii*) and lamprey (*Geotria australis*), all considered declining under recent threat classification (Allibone *et al.,* 2009) are also found within this catchment.

A historic survey of sites within the ED that have notable wildlife values (Moynihan, 1986) showed the presence of bats, as well as threatened bird species such as pied tomtit (*Petroica macrocephala toitoi*), bellbird (*Anthornis melanura melanura*), spotless crake (*Porzana tabuensis plumbea*), North Island fernbird (*Bowdleria punctata vealeae*), banded rail (*Gallirallus philippensis assimilis*) and bittern (*Botaurus poiciloptilus*) in and around the Raglan ED. These species are all now considered threatened or potentially regionally uncommon.

4.2.7 Protected natural areas

The DOC administered Kaniwhaniwha Scenic Reserve lies within the south-eastern corner of the Raglan ED and the Waipa District boundary. This site provides habitat for threatened birds, bats and freshwater fish species. It is mainly secondary forest with some primary hardwoods and broadleaf species.

4.2.8 Key significant natural areas

The south-eastern section, within the Waipa District boundary, includes areas of karst landscapes, components of which are considered to host historically rare ecosystem types (e.g. caves and cracks in karst; calcareous cliffs, scarps and tors; cave entrances) (Williams *et al.,* 2007).

4.3 Hamilton Ecological District

4.3.1 Overview

The total area of the Hamilton ED is 159,367 ha, which covers the area north-east of Pirongia along the western boundary to just east of Huntly. The northern ED boundary reaches across to Morrinsville then eastward to Cambridge, down towards the western hill slopes of Maungatautari. The southern boundary extends from Maungatautari, north of Te Awamutu to the eastern slopes of Pirongia.

Only 40 % (63,886 ha) of the Hamilton ED is within the boundaries of the Waipa District. The northern margins of the Waipa District run from the Kapamahunga Ranges, south of Hamilton and east following the Waikato River, to the northern extent of Cambridge.

4.3.2 Bioclimatic zones

The area of the Hamilton ED that lies within the Waipa District is classified within the lowland bioclimatic zone. This area is characterised by warm summers with very little wind and rain with periods of severe frosts in the cooler months. The annual mean temperature for the district is 14°C. Rainfall averages 1,100-1,400 mm with slightly higher rainfall near Pirongia and Maungatautari.

4.3.3 Geology and soils

The geological characteristics and soils in the Hamilton ED are largely influenced by the presence of the Waikato River. The Hamilton basin is an alluvial plain with extensive deposits of silt, sand and gravel, Holocene peatlands, small lakes and wetlands (Wildland Consultants, 2007). Deposits from the central plateau were historically carried along the Waikato River and include Hinuera formation alluviums and pumiceous sediments, forming loamy soil in the southern reaches of the ED. Other soil types include yellow-brown earths in the north east, central brown granular loams in the north-west and organic soil derived from peat bogs in the centre.

4.3.4 Vegetation

Evidence from soil core samples and pollen analysis suggest that historically, most of this area was once covered in conifer-broadleaf forest (Newham *et al.*, 1989) with the ranges to the west dominated by broadleaf forest and podocarp forest to the east of the Hamilton basin. In the steeper and hillier regions, rimu/tawa forest with emergent hardwood, broadleaf species forming the second tier and a ground cover of ferns would have been typical. Kauri and hard beech forest were found in the northern extent of the Hamilton ED but is rare in the southern reaches. Kahikatea semi-swamp forest would have been dominant in the wetter, low-lying areas of the Hamilton basin with extensive wetland and peat bog systems (Clarkson *et al.,* 2001). Mixed conifer-broadleaf forest would have grown on the slightly elevated mounds and ridges. The well drained terraces adjacent to the Waikato River, along the northern boundary of the Waipa District would once have been totara-matai-kowhai forest.

The Hamilton basin and surrounding area has thought to have been settled for about 1,000 years, with large areas of bush being cleared both pre and post-European settlement (Newham *et al.*, 1989). Much of the area has been converted to farmed pasture and residential property with only a handful of original forest and wetland habitats remaining. Most of the remaining areas of indigenous vegetation are small and fragmented.

Leathwick *et al.* (1995) calculated the decline in indigenous vegetation since 1840 and current percentage cover. Since 1840, the Hamilton ED has had a 97.77 % reduction in indigenous vegetation. Percentage cover of indigenous vegetation in 1995 was about 1 % forest and less than 1 % scrub and wetland for the entire Hamilton ED.

4.3.5 Flora

A variety of threatened plant species are found within this southern end of the Hamilton ED in wetland, peat land and forest remnants. Nationally endangered yellow bladderwort (*Utricularia australis*); can be found in wetland and lake margins around Lake Ngaroto, Lake Serpentine, Lake Rotomanuka and north-east of Cambridge. In the Moanatuatua peat bog, bamboo rush (*Sporadanthus ferrugineus*), bladderwort (*Utricularia delicatula*) can be found; with the nationally critical swamp helmet orchid (*Anzybas carsei*) once recorded at this site (DOC, 2010).

4.3.6 Fauna

Multiple threatened species are found within the southern extent of the wider Hamilton ED. The nationally vulnerable long-tailed bat has been recorded all across the area, mainly in the west, near the foothills of Pirongia (DOC Bioweb), but also to the north of the Kapamahunga ranges and near the Hamilton airport. Threatened lizard species include the Pacific sticky-toed gecko (*Hoplodactylus pacificus*), Auckland green gecko (*Naultinus elegans elegans*) and speckled skink (*Oligosoma infrapunctatum*), which have been recorded near the western margins.

Mobile bird species such as the nationally vulnerable North Island kaka have been recorded near the south-eastern margins, near Cambridge and the southern suburbs of Hamilton city. Multiple threatened bird species, as classified in Miskelly *et al.* (2008), are found in lake, wetland and peat bog habitats within the district. Lake Ngaroto and nearby lakes are home to the nationally threatened bittern, NZ dabchick (*Poliocephalus rufopectus*), banded rail, black shag (*Phalacrocorax carbo novaehollandiae*), little black shag (*Phalacrocorax sulcirostris*), spotless crake (Porzana tabuensis plumbea), grey duck (*Anas superciliosa superciliosa*), red-billed gull (*Larus novaehollandiae scopulinus*) and the occasional white heron (*Ardea modesta*). NZ dabchick have also been noted further north at Lake Cameron.

The Hamilton ED is home to numerous threatened fish species as identified in Allibone *et al.* (2009). The NIWA FFDB indicates the presence of longfin eel, lamprey, inanga, giant kokopu (*Galaxias argenteus*), shortjaw kokopu (*Galaxias postvectis*), torrentfish and black mudfish (*Neochanna diversus*), all classified as declining. The threatened koura (*Paranephrops planifrons*) is also found widely distributed around the district. Common freshwater species include Cran's bully, common bully, banded kokopu (*Galaxias fasciatus*) and shortfin eel. Introduced species include brown trout, rudd (*Scardinius erythrophthalmus*), catfish (*Ameiurus nebulatus*), koi carp (*Cyprinus carpio*), goldfish (*Carassius auratus*) and gambusia (*Gambusia affinis*). Grey mullet (*Mugil cephalus*), considered a marine wanderer, is also found within the Hamilton ED.

4.3.7 Protected natural areas

The Hamilton ED has multiple protected areas that are managed by private landowners, local district councils and DOC. Near the southern ED boundary, Lake Ruatuna, Lake Serpentine, Lake Ngarotoiti and Lake Rotomanuka are administered by DOC along with the largest remnant of the Moanatuatua Peat Bog to the east. Lake Koromatua and the Kaniwhaniwha reserve found near the northern most margins are also under DOC protection. Lake Ngaroto, Lake Maratoto and Lake Mangakaware and Yarndley's Bush are under Waipa District council protection as well as a small remnant of the Moanatuatua peat bog. The Waipa DC is also responsible for numerous bush remnants on private land and riparian margins along key waterways.

4.3.8 Key significant natural areas

The western margin of the Hamilton ED, along the Raglan and Kawhia ED boundaries, has areas of rare karst landscapes. The Moanatuatua Peat Scientific Reserve is the last remaining area of a once vast peatland and is home to multiple threatened species. Peat Lakes such as Koromatua, Rotomanuka, Serpentine, Ngaroto and Mangakaware are all considered to be key significant natural areas, as is Yarndley's Bush, a relatively large and protected kahikatea remnant that is considered to have a high restoration potential and to provide linkage to surrounding fragments.

4.4 Maungatautari Ecological District

4.4.1 Overview

The Maungatautari ED covers an area of 87,300 ha, about half (39,539 ha) of that lies within the eastern side of the Waipa District (Wildland Consultants, 2007). The part of the Maungatautari ED that is encompassed within the Waipa District stretches north from, and includes, the southern slopes of Maungatautari up to the eastern slopes of Te Tapui and Maungakawa. The western boundary extends from just west of Te Miro down to the transition from Lake Karapiro to the Waikato River, then to the west of Maungatautari.

4.4.2 Bioclimatic zones

Most of the Maungatautari ED is within the lowland bioclimatic zone. Maungatautari and nearby hills (greater than 300 m a.s.l.) and hills south-west of Te Tapui all lie within the submontane zone. Summers are usually warm and humid with winters being mild. Average annual rainfall is usually between 1,200 mm and 1,400 mm.

4.4.3 Geology and soils

The area around and including Maungatautari is brown granular clay/loam and yellow-brown loam on an andesitic base. Surrounding the andesitic lava are ringplain lahars (DOC, 2010) which are a clear indicator of the mountains active volcanic history. Further north, around Te Tapui and Maungakawa, basalt, andesite and greywacke form the base layer. Yellow-brown earths, brown granular clay/loam and sandy loam are the main soil types in the northern area (DOC, 2010) within the Waipa District.

4.4.4 Vegetation

In 1840, the Maungatautari ED was about 57 % forest, 42 % scrub and 1 % wetland and other habitats. In 1995, forest cover decreased to only 9 % cover, with scrub and wetlands at less than 1 % cover. The total loss in indigenous vegetation was calculated at 89.5 % or 77,886 ha within the ED (Leathwick *et al.*, 1995). The most significant areas of vegetation within the Waipa boundary include Maungatautari reserve in the south and the southern half of the Te Miro Scenic Reserve in the north. Both sites are habitat for threatened plant species.

4.4.5 Flora

Threatened species found within the Waipa District boundary and Maungatautari ED include king fern, wood rose (*Dactylanthus taylorii*), NZ watercress (*Rorippa divaricata*) and tainui (*Pomaderris apetala subsp. maritima*). Tainui has been classified as nationally critical and usually grows in exposed coastal habitat but has become artificially naturalised in drier areas (NZPCN, 2010) probably due to introduced plantings. A stand of 100 silver beeches (*Nothofagus menziesii*) were observed within the Maungatautari reserve in 2005, which is uncommon in the Waipa District (DOC, 2010).

White mistletoe (*Trilepidea adamsii*), now considered extinct was last observed on Sanatorium Hill, Maungakawa in 1954.

4.4.6 Fauna

The re-introduction of threatened fauna to the Maungatautari district since the establishment of the Maungatautari ecological island has made this ED an important area for biodiversity. The nationally vulnerable long-tailed bat has been recorded widely within the south-western and north-western extent of the ED. These species are known to utilise bush fragments and gully systems and have wide home and feeding ranges. Hochstetter's frog (*Leiopelma hochstetteri*), Pacific sticky-toed gecko, bellbird and North Island kaka are found on Maungatautari with North Island brown kiwi, takahe, stitchbird (*Notiomystis cincta*) and yellow-crowned parakeets (*Cyanoramphus auriceps*) being recently introduced. Bellbirds, which are regionally uncommon, are also found to the north, in the Te Miro Scenic Reserve. Pied tomtit have been recorded on Te Tapui, so it is possible they may traverse the Waipa District boundary and utilise the nearby, larger bush remnants. North Island kaka has been recorded on Te Tapui so it is likely they utilise bush remnants within the Waipa District boundary.

Bittern have been observed north-east of Maungatautari near some wetland remnants west of the Waikato River.

Threatened freshwater fish species such as koaro (*Galaxias brevipinnis*) have been found on the eastern slopes of Maungatautari. Longfin eel and koura are found in multiple waterways within the Maungatautari ED and Waipa District (NZFFD, 2010). Giant kokopu (*Galaxias argenteus*) were re-introduced to several streams on the southern side of Maungatautari Ecological Island in 2007. They were released into unnamed tributaries of two different catchments – one release into a tributary of the Waikato River catchment and the other into the Umutawa Stream headwaters (Mike Lake pers comm; Senior Freshwater Ecologist, Kessels & Associates Ltd). A monitoring report confirmed they were still present in 2009 and discussion with the release project supervising ecologist suggests they are still present in 2011 (Jane Goodman pers comm: Freshwater Water Technical Support Officer, DOC).

Common bush birds such as tui, kereru, grey warbler, shining cuckoo, fantail and kingfisher have been recorded all over this area, particularly within the larger areas of bush.

4.4.7 Protected natural areas

Two large bush reserves are contained within the Maungatautari ED and Waipa District boundary. The Te Miro Scenic Reserve is located in the north, the Maungatautari reserve in the south. The Te Tapui and Maungakawa reserves are positioned just outside the north-eastern margins. There are also some small bush remnants protected under Waipa District council reserves and private QEII reserves.

4.4.8 Key significant natural areas

The largest and most significant natural area within the Maungatautari ED is the Maungatautari ecological island which is surrounded by a predator proof fence, creating a refuge for multiple threatened species.

4.5 Kawhia Ecological District

4.5.1 Overview

The Kawhia ED covers an area of 128,370 ha (Wildland Consultants, 2007) with 5,332 ha of this within the western margins of the Waipa District. The Kawhia ED ranges from north of Mt. Karioi on the west coast near Raglan, down to the south of Kawhia Harbour. The boundary then curves up towards, and includes the eastern slopes of Mt Pirongia, up to the south-eastern boundary of the Raglan ED. This ED is very diverse in terms of altitude, geology, and includes multiple threatened plant and animal species.

4.5.2 Bioclimatic zones

The western extent of the Kawhia ED falls within the coastal zone (within 1 km of the coast). Most of the ED falls within the lowland zone with Mt Karioi, Mt Pirongia and the southern ranges are within the submontane zone. The section of this ED that falls within the Waipa District is a mix of lowland and submontane zones. Summers are usually warm and humid with some periods of drought. Winters are often mild with annual rainfall ranging between 1,400 mm and 2,500 mm (Wildland Consultants, 2007) and a prevailing westerly wind.

4.5.3 Geology and soils

Kawhia is well known as a geological area of interest and has a long history of study. It was first noted by Hochstetter in 1964 and since then has been analysed in terms of lithology, stratigraphy and paleontological content (Meesook & Grant-Mackie, 1995). Most of the area is broadly classified as Triassic and Jurassic rocks with notable features such as large areas of limestone, particularly inland, and layers of fossilised marine molluscs (Meesook & Grant-Mackie, 1995). Regionally rare karst and cave formations can be found in the north-western corner of the Waipa District, within the Kawhia ED. These systems form when water channels and cuts through the limestone, forming an underground cave system (Williams *et al.*, 2007).

Parts of the ED were once volcanically active. Mt Karioi is an extinct basaltic and andesitic cone from the Pliocene age (Clayton-Greene & Wilson, 1985). Within the Waipa District boundary, lies Pirongia, which is also an extinct volcano made up of mainly basalt and andesite (DOC, 2010) with yellow-brown loam and brown granular clay/loam forming the uppermost soil layers. A small deposit of coal has been found on the north-western slopes of Pirongia, beyond the Waipa District boundary (DOC, 2010).

4.5.4 Vegetation

The wider Kawhia ED has a few notable features, including relatively intact areas of native forest and the presence of montane flora on Mt. Karioi and Mt. Pirongia (Clayton-Greene & Wilson, 1985). Pirongia is the largest, continuous tract of indigenous vegetation in the Waikato Region and provides habitat for multiple threatened plants and animals. In 1840, 95 % of this ED was covered in indigenous forest and 1 % scrub. By 1995, there was a reduction of at least 63 % of indigenous vegetation cover to 35 % forest, 1 % scrub and less than 1 % wetland (Leathwick *et al.*, 1995).

4.5.5 Flora

Threatened flora found within the Kawhia ED and Waipa District include *Pseudopanax laetus* (regionally rare), swamp maire (*Syzygium maire*, regionally rare), wood rose (nationally vulnerable), kohurangi (*Brachyglottis kirkii,* declining) and thick-leaved kohukohu (*Pittosporum kirkii*, declining).

4.5.6 Fauna

The Kawhia ED is known habitat for numerous threatened species. The key site for most of these species is Pirongia forest park which covers 1,500 ha and provides habitat for multiple threatened birds (Innes *et al.,* 2003) and long-tailed bats (DOC Bioweb, 2010). Bats are known to have a wide feeding range and regularly move between roosting sites. They rely on both open areas and gullies for feeding as well as large, mature trees for roosting so it is likely that they will utilise smaller stands of bush and gullies within the Waipa District.

Historical records show that the North Island kokako (*Callaeas wilsoni*), North Island brown kiwi, blue duck (*Hymenolaimus malachorhynchos*) and rifleman (*Acanthisitta chloris*) were found in low numbers. It is possible that some of these species are now locally extinct as kiwi were last observed in 1983, kokako in 1996 and blue duck in 1983 (DOC, 2010). Other threatened birds found here include whitehead (*Mohoua albicilla*), North Island kaka (*Nestor meridionalis septentrionalis*), NZ falcon (*Falco novaeseelandiae*), long-tailed cuckoo (*Eudynamys taitensis*), yellow-crowned parakeet, regionally uncommon bellbird and pied tomtit. North Island kaka and NZ falcon are known to have large home ranges so it is likely that they utilise smaller areas of bush and open country nearby for feeding. Common native species include tui (*Prosthemadera novaeseelandiae novaeseelandiae*), grey warbler (*Gerygone igata*), shining cuckoo (*Chrysococcyx lucidus lucidus*), kereru (*Hemiphaga novaeseelandiae novaeseelandiae*) and NZ pipit (*Anthus novaeseelandiae novaeseelandiae*).

The slopes of Pirongia and nearby streams have threatened koaro (*Galaxias brevipinnis*), longfin eel, lamprey, torrentfish, inanga, redfin bully (*Gobiomorphus huttoni*) and shortjaw kokopu (NZFFD, 2010, Allibone *et al.*, 2009). Common indigenous species include giant bully, common bully, Cran's bully, common smelt, banded kokopu and shortfin eel. Introduced species such as brown trout and rainbow trout are also present (NZFFD, 2010).

4.5.7 Protected natural areas

There are multiple protected areas encompassed within the small area of the Kawhia ED that falls within the boundaries of the Waipa District. There is a marginal strip that follows the Kaniwhaniwha Stream from the north-eastern slopes of Pirongia to the bridge at Limeworks Loop Road and a small scenic reserve along Rolley Road. The eastern slopes of Pirongia, which form part of the much larger Pirongia forest park, are currently administered by DOC.

4.5.8 Key significant natural areas

The northern strip of the Kawhia ED that lies within the Waipa District has been identified as having karst formations including caves, which are considered historically rare in New Zealand (Williams *et al.*, 2007), and regionally rare in the Waipa District.

4.6 Waipa Ecological District

4.6.1 Overview

The Waipa ED is located in the southern end of the Waipa District. The northern boundary extends from the eastern foothills of Pirongia north of Te Awamutu, to the western foothills of Maungatautari. The eastern boundary runs down to, and includes Te Kuiti, then curves back up towards Pirongia. The total area of the Waipa ED is 69,634 ha (Leathwick *et al.,* 1995), with only 22,861 ha within the Waipa District. This ED provides habitat for threatened flora and fauna species.

4.6.2 Bioclimatic zones

Most of the Waipa ED is within the lowland zone (<300 m). The summit of Kakepuku (>300 m) is considered within the submontane zone. The Waipa ED has warm, humid summers and relatively mild winters with the occasional ground frost. Average annual rainfall is between 1,100 mm and 1,500 mm.

4.6.3 Geology and soils

The lowland region of this ED is mostly silt loam of alluvial floodplain origin with peat loams in areas that were historically peat bogs. Some of the hills and ridges are clay loam with small areas of sandstone in more elevated areas. Kakepuku is a basaltic dome with central yellow-brown loam soil type. The eastern hill slopes of Pirongia are also influenced by its volcanic history with andesitic and basalt rock formations and yellow-brown loam soil type (DOC, 2010).

4.6.4 Vegetation

In 1840, the Waipa ED was almost entirely covered in indigenous vegetation. About 15 % was forested, 80 % indigenous scrub and 5 % wetland habitat. By 1995 this coverage had dropped dramatically, with between 1-2 % vegetation remaining. Only 1 % of indigenous forest, <1 % of scrub and <0.5 % of wetlands cover the Waipa ED (Leathwick *et al.,* 1995). Most of this ED is now farmed pasture and residential property. The area of the Waipa ED within the Waipa District provides habitat for threatened plants and animals.

4.6.5 Flora

Threatened flora have been recorded within the Kakepuku reserve and include the naturally uncommon filmy fern (*Hymenophyllum atrovirens*) and the declining king fern (DOC, 2010).

4.6.6 Fauna

The nationally vulnerable long-tailed bat has been recorded in the north-west, near Pirongia and in Kihikihi township. The gradually declining goldstripe gecko (*Hoplodactylus chrysosireticus*) and Auckland green gecko has been recorded at Kakepuku reserve, with the Auckland green gecko also recorded near Parawera township.

4.6.7 Protected natural areas

The largest area currently protected within the Waipa ED is the Kakepuku Reserve. The western side of the mountain is under DOC administration, the eastern side is under Waipa District council protection. There are also multiple district council covenants and QEII reserves on private property and riparian margins along key waterways such as the Puniu River and Mangaohoi Stream.

4.6.8 Key significant natural areas

Kakepuku maunga is the largest area of intact indigenous vegetation and provides habitat for multiple threatened species.

4.7 Ranginui Ecological District

4.7.1 Overview

The Ranginui ED covers a total of 112,669 ha (Leathwick *et al.*, 1995) between the southern slopes of Maungatautari down to the Rangitoto Range. The eastern margin follows Lake Arapuni and includes a large area of the upper Waipa River catchment. Only 13,975 ha (12 %) of the northern tip of the wider ED is within the Waipa District boundary.

4.7.2 Bioclimatic zones

The Rangitoto Range, which makes up a large part of the wider Ranginui ED is between 300-800 m altitude and classified as within the sub-montane zone. Pukewhakaahu Mountain (332 m), in the northern end of the ED, is the only area of the submontane zone that is within the Waipa District. The rest of this ED is classified as being within the lowland zone. Summers are generally warm and humid with mild winters with frequent frosts occurring in the south-eastern reaches (Harding, 1997). Mean annual rainfall for the ED is 1,500-2,000 mm (Wildland Consultants, 2007).

4.7.3 Geology and soils

The geology and soil types found in the Ranginui ED are influenced by rivers and streams that form deep gullies and alluvial plains. The Rangitoto Range is largely greywacke and ignimbrite (Wildland Consultants, 2007). The south-eastern reaches are predominantly pumice soil with silty and sandy loams in alluvial areas (Harding, 1997).

4.7.4 Vegetation

In 1840, 90 % of the Ranginui ED was covered in indigenous forest and 9 % scrub. By 1995 there had been a 74 % reduction in this vegetation cover to 24 % forest, 1% scrub and less than 1 % wetland. Historically, this ED was covered in mainly rimu-tawa forest on hill slopes, with podocarp and matai forest was dominant in low lying areas. In 1994, most of the vegetation type was rimu-tawa, tawa, regenerating bush and shrubland (Harding, 1997).

4.7.5 Flora

There are currently no records of threatened flora within the Ranginui ED.

4.7.6 Fauna

Multiple threatened species, both freshwater and terrestrial, are found within the Ranginui ED and Waipa District. New Zealand dabchick, black shag and little black shag have all been recorded at Lake Rotongata (DOC, 2010). The North Island long-tailed bat has been recorded near an Arapuni Road bush remnant (DOC, 2010). They are likely to be found near the northern ED boundary, utilising valleys and bush remnants south of Maungatautari ecological island.

A search of the NIWA NZFFD (2010) revealed the presence of multiple threatened fish species within the area of the ED within the Waipa District. The declining longfin eel, lamprey, giant kokopu and the relictual black mudfish (Allibone *et al.*, 2010) have all been recorded here. Non-threatened indigenous species include common bully, Cran's bully, common smelt and shortfin eel and the introduced rainbow trout and brown trout are also present.

4.7.7 Protected natural areas

The Ranginui ED, within the Waipa District boundary is mostly unprotected with some river margins, such as the Waipari Stream, under DOC protection. The margins of Lake Rotongata and a small bush remnant to the west are currently under QEII covenant.

4.7.8 Key significant natural areas

There are currently no key significant natural areas identified within the Ranginui ED.

4.8 Tokoroa Ecological District

4.8.1 Overview

The entire Tokoroa ED covers 110,080 ha, with only a small fraction (2 ha) along the western banks of Lake Arapuni falling within the Waipa District (Leathwick *et al.*, 1995). The wider district has large areas of mostly pine plantation beyond the Waipa District margins.

4.8.2 Bioclimatic zones

A large portion of the Tokoroa ED is within the submontane zone (300-800 m a.s.l.). The northern extent, including the area within the Waipa District, is in the lowland zone (0-300 m a.s.l.). Summers are generally warm and winters are cool with frosts common, particularly in the lowland areas.

4.8.3 Geology and soils

The northern extent of the Tokoroa ED, near the Waikato River is generally flat, rolling country with low relief and entrenched streams (Harding, 1997). Soils here are mainly ash soils with alluvial deposits and pumice from the central plateau over an ignimbrite base (Harding, 1997). There are no outstanding geological features within or near the 2 ha of this ED that lies within the Waipa District.

4.8.4 Vegetation

Historically, the Tokoroa ED was totally covered in indigenous vegetation, 31 % of that forest and 69 % indigenous scrub (Leathwick *et al.,* 1995). Harding (1997) identified the dominant forest type as rimu-tawa forest on the hilly country, rimu-matai-broadleaved forest on the lower regions with areas of dense podocarp forest. Between 1840 and 1995, there was an estimated 89 % reduction in vegetation cover with only 11 % forest and 1 % scrub remaining (Leathwick *et al.*, 1995). The ED is now dominated by farmed pasture and forestry.

4.8.5 Flora

There are no threatened flora records along the banks of Lake Arapuni.

4.8.6 Fauna

There are no threatened terrestrial fauna records in the north-western corner of the Tokoroa ED, but threatened species recorded in Maungatautari may utilise valleys and Lake Arapuni margins for feeding. Multiple non-threatened waterfowl and bush birds are likely to utilise bush and wetland remnants, particularly Lake Arapuni and the Waikato River.

A search of the NIWA NZFFD (2010) showed only one record of longfin eel (Declining) within the Tokoroa ED and Waipa District. Koura are present in the surrounding area, as well as non-threatened indigenous fish species such as shortfin eel, common bully and common smelt. Introduced species recorded include catfish, rudd, goldfish, rainbow and brown trout.

4.8.7 Protected natural areas

There are currently no protected natural areas within the small portion of the Tokoroa ED within the Waipa District.

4.8.8 Key significant natural areas

No key significant natural areas have been identified within this small portion of the Tokoroa ED and Waipa District.

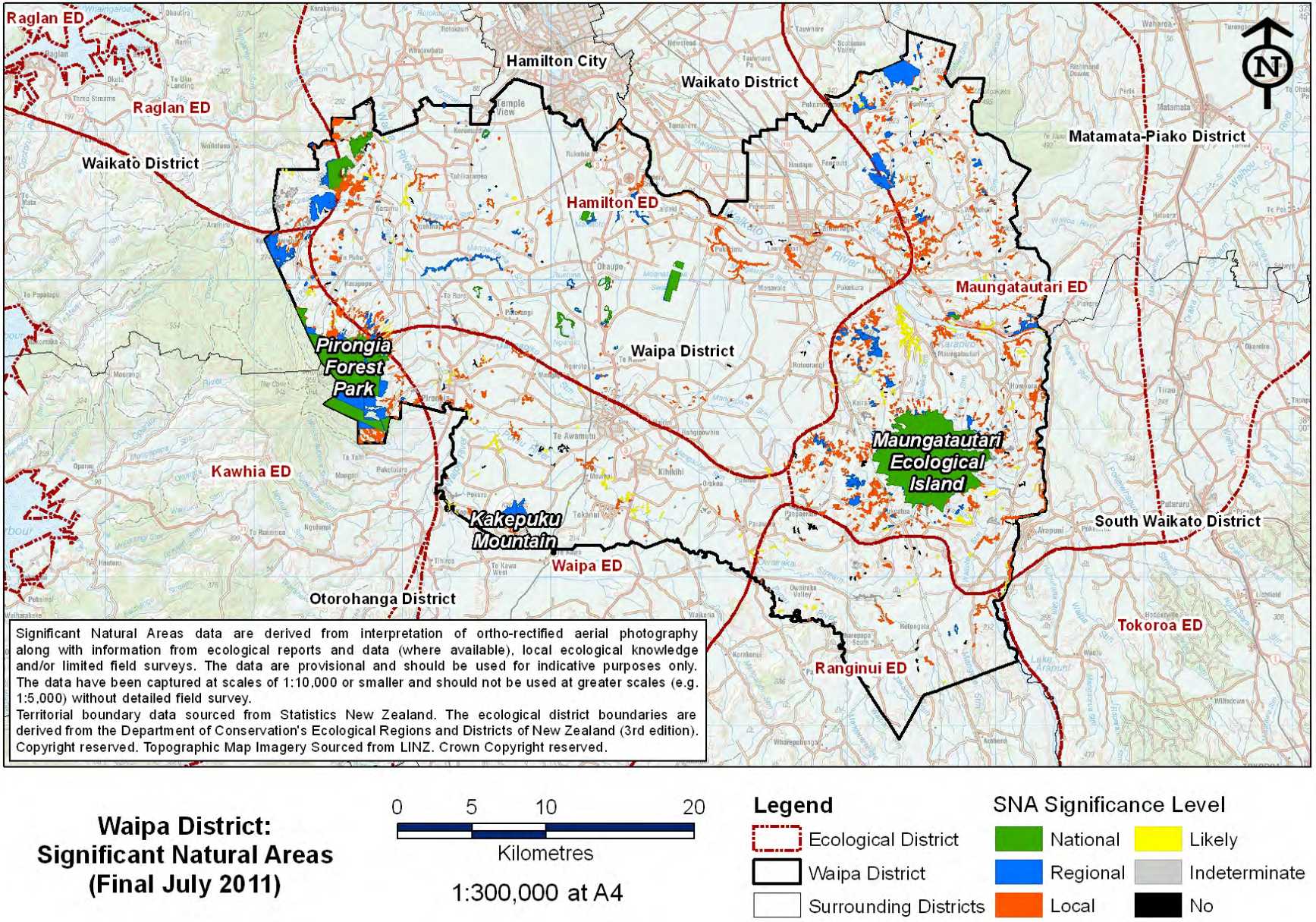

Figure 2 Significant Natural Areas of the Waipa District with Ecological Districts overlain

5 Threatened Environments and Threatened Species of the Waipa District

5.1 Extent of Nationally Threatened Environments within Waipa District

Land Environments of New Zealand (LENZ) is a national environment-based classification of ecosystems mapped across New Zealand's landscape. LENZ is a surrogate for the likely past (pre-human) pattern of terrestrial ecosystems and their associated biodiversity. Landcare Research has mapped, at a national level, the most rare and threatened environments and ecosystems across the whole of New Zealand. This national level information is only part of the biodiversity picture that is needed to inform resource management decisions at the regional and local level.

National Priority 1 uses LENZ, the Land Cover Database (LCDB) and a national database of land protection status to identify what type of vegetation occurs in each land environment and the broad pattern of protection (Department of Conservation & Ministry for the Environment, 2007). The aim of "National Priority 1" is to protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level lV) that have 20 percent or less remaining in indigenous cover (i.e. the Acutely and Chronically threatened environments). Maps of National Priority 1 environments have been prepared at LENZ Level IV (i.e. 500 land environments) and show land environments with 20% or less remaining in indigenous vegetation from a national perspective (Walker *et al.*, 2005). The vast majority of Waipa District is categorised as National Priority 1.

Walker *et al.* (2005) proposed a threat classification for remaining indigenous biodiversity in New Zealand's environments based on the two components of vulnerability (likelihood of loss): poor legal protection and risk of loss[4]. The past level of habitat loss (represented by percentage of remaining indigenous cover) is used as the primary threat criterion. Based on the species–area relationships and fragmentation effect, remaining indigenous biodiversity within environments with <30 % indigenous cover are considered 'threatened'. Remaining indigenous biodiversity is classified as 'At Risk' in environments where 20–30 % of indigenous cover remains, and 'Chronically Threatened' in environments where 10–20 % indigenous cover remains. When less than 10 % of indigenous cover remains, remaining indigenous biodiversity is considered to be 'Acutely Threatened' (Table 1).

A threat classification based on past habitat loss alone (and hence susceptibility to loss) is insufficient, since it fails to recognise poor legal protection as a key component of biodiversity vulnerability. Many environments with low (i.e. less than 20 %) levels of legal protection are included in the 'At Risk', 'Chronically Threatened' and 'Acutely Threatened' categories. However, a number of environments that have more than 30 % indigenous cover remaining are poorly protected (i.e. they have less than 20 % of their area under legal protection). Remaining indigenous biodiversity in these environments is assigned to two further threat categories (Table **1**): Critically Under-protected if <10 % is protected, and Under-protected if 10–20 % is protected.

Table 1 Categories of threat to environments, and defining criteria (Walker *et al.*, 2005)

Category	Acutely Threatened	Chronically Threatened	At Risk	Critically Under-protected	Under-protected
Criteria	<10% indigenous cover remaining	10–20% indigenous cover remaining	20–30% indigenous cover remaining	>30% indigenous cover remaining	
				<10% legally protected	10–20% legally protected

Walker *et al.* (2005) have calculated that 1,106 ha of the Waipa District contain indigenous habitat that is presently nationally threatened (i.e. Acutely and Chronically threatened), and 1,989 ha of

[4] The main tool for this analysis was Land Environments of New Zealand (LENZ) - a national classification of ecosystems mapped across New Zealand's landscape. For this analysis LENZ Level II, which maps 100 different environments nationally, was used.

habitat within Waipa District that is under-protected nationally (Table 2). When the SNA significance analysis data is overlaid onto the LENZ layer it is apparent that large proportion of locally significant sites (some 1,739 ha) lies within the "Acutely Threatened" Category (Table 3) and that this detailed study has found that in fact 3,661 ha (as opposed to the 1,106 ha estimated in the Walker *et al.* 2005 study) is left which can be considered nationally significant under the National Priority 1 criteria. These statistics highlight that nationally threatened vegetation units are quite under-represented and not well protected within Waipa District, particularly where large components of flat and easy hill country and highly fertile areas have largely been developed for agriculture.

Table 2 Area of indigenous cover (ha) in five threatened environments for Waipa District

Total remaining indigenous cover in Waipa District	Acutely Threatened	Chronically Threatened	At Risk	Critically Under-protected	Under-protected
144,427	892	214	770	0	1,989

Table 3 Summary of LENZ area in hectare within Waipa District

SIGNIFICANCE	Acutely Threatened	Chronically Threatened	At Risk	Under-protected	Less reduced and better protected	Grand Total
National	413.08	0.17	916.65	15.53	4133.24	5478.67
Regional	554.27	105.07	545.07	42.10	1157.96	2404.47
Local	1738.70	195.74	469.59	23.97	635.26	3063.26
Likely	348.99	23.05	21.31	5.65	19.00	418.00
Indeterminate	161.56	5.16	13.42	1.05	79.26	260.45
Not Significant	108.28	7.46	20.30	1.59	12.65	150.28
Total Left	**3324.89**	**336.65**	**1986.34**	**89.90**	**6037.37**	**11775.14**
Waipa District	**120097.33**	**2312.50**	**9855.91**	**516.71**	**12541.68**	**145324.13**

5.2 Threatened Species

A total of 73 nationally threatened species (24 flora species and 49 fauna species) have been recorded as being present within the Waipa District as defined by the Department of Conservation (e.g. Hitchmough *et al.*, 2007; Hitchmough *et al.*, 2009; Miskelly *et al.*, 2008; de Lange *et al.*, 2009) in the databases searched. These threatened species are listed in Tables 4 to 10. Threat classification was determined using the New Zealand Threat Classification System manual (Townsend *et al.*, 2008)

The threat status of species is important and has had a significant bearing on the SNA assessment. The most up-to-date threat status rankings were used for this assessment (i.e. Hitchmough *et al.*, 2007; Hitchmough *et al.*, 2009; Miskelly *et al.,* 2008; de Lange *et al.*, 2009; Allibone *et al.*, 2010; O'Donnell *et al.*, 2010). However, the threat status rankings are reviewed every three years and a change in threat ranking can change the significance of an SNA dramatically. For example, the long-tailed bat, which is ranked at a Nationally Vulnerable threat status, meant that SNA where this species has been found and was considered to use the site on a regular basis were considered significant at a "National" level, regardless of whether any other records of threatened species were known for the site or any other 11 RPS criteria were met by the site.

Much of the data used for this analysis is more than ten years old and some animal (and plant) species may now be locally extinct. It is recommended that this data is used with a precautionary approach, such that sites where data is older than twenty to thirty years should be resurveyed to confirm if a threatened species is still present. For example, during the

course of this analysis it was difficult to gauge the present extent and abundance of bittern and grey duck within the Waipa District, since many of the records are now greater than fifteen years old. Because of this, for fauna species, only records of threatened species that were known to be resident and/or not greater than half the expected lifespan of a species were used in the assessment of SNA sites.

5.2.1 Threatened Flora Species

Populations of threatened flora within the SNA of the Waipa District are mainly found in reasonably isolated wetland remnants associated with peat bogs or within larger areas of indigenous forest such as Mt. Pirongia, Mt. Maungatautari or Maungakawa Scenic Reserve. Threatened plants are at risk of rapidly becoming locally extinct if a management regime changes or a new pest or disease strikes a local population. Threatened plants situated on privately owned, unprotected land are particularly vulnerable. Table 4 lists the nationally threatened flora species recorded within the Waipa District.

Table 4 Threatened Vascular Plant Species recorded in Waipa District (names and threat status obtained from DOC Bioweb Threatened plant database 2009; Brandon *et al.*, 2004; and de Lange *et al.*, 2009)

Scientific name	Common name	Threat category
Astelia grandis	Swamp astelia	Not threatened – Regionally uncommon
Botrychium australe	Parsley fern	Naturally uncommon
Brachyglottis kirkii var. kirkii	Kirk's daisy	Declining
Dactylanthus taylorii	Wood rose	Nationally vulnerable
Hymenophyllum atrovirens	Filmy fern	Naturally uncommon
Mida salicifolia	Willow-leaved maire, Maire Taike	Not threatened – Regionally uncommon
Pimelea tomentosa	None known	Nationally vulnerable
Pittosporum cornifolium	Tawhirikaro	Not threatened – Regionally uncommon
Pittosporum kirkii	Kirk's kohuhu, thick-leaved kohukohu	Declining
Pomaderris apetala subsp. maritima	Tainui	Nationally critical
Pseudopanax laetus	None known	Naturally uncommon
Ptisana salicina	King fern, Para, Tawhiti para, Horseshoe fern	Declining
Raukaua edgerleyi	Raukawa	Not threatened – Regionally uncommon
Rorippa divaricata	New Zealand water cress, Matangaoa	Nationally vulnerable
Sporadanthus ferrugineus	Bamboo rush	Relict
Sporadanthus traversii	Chatham Island bamboo rush	Naturally uncommon
Syzygium maire	Swamp maire	Not threatened – Regionally uncommon
Thismia rodwayi	None known	Naturally uncommon
Trilepidea adamsii	White mistletoe	Extinct
Tupeia antarctica	White mistletoe	Declining
Utricularia australis	Yellow bladderwort	Nationally endangered
Utricularia delicatula	Bladderwort	Relict

5.2.2 Threatened Fauna Species

As part of the SNA assessment process, past records of threatened indigenous fauna species were included. However, many species, such as NZ kaka and NZ falcon, are highly mobile and have large territories and vast home ranges. It is therefore difficult to predict

where these species may utilise suitable habitats throughout a year, so habitat utilisation is probably much broader than specific points in time as shown on a database.

Other fauna species, such as Hochstetter's frog and the long-tailed bat, are regularly being discovered in new sites and habitats as ecological investigations for resource consents and/or scientific research are conducted in conjunction with improved survey methods and technology. To this extent, the SNA database needs to be regularly updated to reflect this.

The following five tables list the nationally threatened fauna species recorded in the Waipa District.

Table 5 Threatened Bird Species recorded in Waipa District (names and threat status obtained from Miskelly *et al.*, 2008)

Scientific name	Common name	Threat category
Acanthisitta chloris granti	North Island rifleman	Declining
Anas chlorotis "North Island"	New Zealand brown teal	Recovering
Anas rhynchotis variegata	New Zealand shoveler	Not threatened – Regionally uncommon
Anas superciliosa superciliosa	Grey duck	Nationally critical
Anthornis melanura melanura	Bellbird	Not threatened – Regionally uncommon
Apteryx mantelli	North Island brown kiwi	Nationally vulnerable
Ardea modesta	White heron	Nationally critical
Botaurus poiciloptilus	Bittern	Nationally endangered
Bowdleria punctata vealeae	North Island fernbird	Declining
Callaeas wilsoni	North Island kokako	Nationally vulnerable
Eudynamys taitensis	Long-tailed cuckoo	Naturally uncommon
Falco novaeseelandiae sensu stricto	Bush falcon	Nationally vulnerable
Gallirallus philippensis assimilis	Banded rail	Naturally uncommon
Himantopus himantopus leucocephalus	Pied stilt	Declining
Hymenolaimus malachorhynchos	Blue duck	Nationally vulnerable
Larus novaehollandiae scopulinus	Red-billed gull	Nationally vulnerable
Mohoua albicilla	Whitehead	Not threatened – Regionally uncommon
Nestor meridionalis septentrionalis	North Island kaka	Nationally vulnerable
Petroica longipes	North Island robin	Not threatened – Regionally uncommon
Petroica macrocephala toitoi	Pied tomtit	Not threatened – Regionally uncommon
Phalacrocorax carbo novaehollandiae	Black shag	Naturally uncommon
Phalacrocorax melanoleucos brevirostris	Little shag	Naturally uncommon
Phalacrocorax sulcirostris	Little black shag	Naturally uncommon
Poliocephalus rufopectus	New Zealand dabchick	Nationally vulnerable
Porphyrio hochstetteri	Takahe	Nationally critical
Porzana pusilla affinis	Marsh crake	Relict
Porzana tabuensis plumbea	Spotless crake	Relict

Table 6 Threatened Mammal Species recorded within Waipa District (names and threat status obtained from O'Donnell *et al.*, 2010)

Scientific name	Common name	Threat category
Chalinolobus tuberculatus	North Island long-tailed bat	Nationally vulnerable
Mystacina tuberculata rhyacobia	Central lesser short-tailed bat	Declining

Table 7 Threatened Fish Species recorded in Waipa District[5] (names and threat status obtained from Allibone *et al.*, 2010; Hitchmough *et al.,* 2007)

Scientific name	Common name	Threat category
Anguilla dieffenbachii	Longfin eel	Declining
Cheimarrichthys fosteri	Torrentfish	Declining
Galaxias argenteus	Giant kokopu	Declining
Galaxias brevipinnis	Koaro	Declining
Galaxias maculatus	Inanga	Declining
Galaxias postvectis	Shortjaw kokopu	Declining
Geotria australis	Lamprey	Declining
Gobiomorphus huttoni	Redfin bully	Declining
Neochanna diversus	Black mudfish	Relict

Table 8 Threatened Herpetofauna recorded in Waipa District (names and threat status obtained from *Hitchmough,* et al, 2010; Newman *et al.*, 2009)

Scientific name	Common name	Threat category
Oligosoma ornatum	Ornate skink	Declining[6]
Hoplodactylus chrysosireticus	Goldstripe gecko	Relict
Hoplodactylus duvaucelii	Duvaucel's gecko	Relict
Hoplodactylus pacificus	Pacific sticky-toed gecko	Relict
Leiopelma hochstetteri	Hochstetter's frog	Declining
Naultinus elegans elegans	Auckland green gecko	Declining
Oligosoma infrapunctatum	Speckled skink	Declining

Table 9 Threatened Invertebrates recorded in Waipa District (names and threat status obtained from DOC staff, pers comm.; Hitchmough *et al.,* 2007)

Scientific name	Common name	Threat category
Deinacrida mahoenui	Mahoenui giant weta	Nationally endangered
Houdinia flexilissima	Houdinia moth	Not threatened – Regionally uncommon
Paranephrops planifrons	Koura, freshwater crayfish	Gradual decline
Sigaus piliferus	Short-horned grasshopper	Not threatened – Regionally uncommon

5.2.3 Regionally Uncommon or Threatened Species

No current assessments are known to exist for regionally threatened, or regionally at risk species, within the Waikato Region. In the absence of these classifications, a precautionary approach was taken to attempt to capture data relating to species that could reasonably be considered as "regionally rare" based on anecdotal observations and reports, such as bellbird

[5] NB: That fish (other than black mudfish) were not specifically mentioned in this report or used in the assessment of ecological significance as the assessment of freshwater habitats is being undertaken in separate Waikato Regional Council studies.

[6] NB: This species has changed its name since its last listing as *Cyclodina ornata* (Hitchmough *et al*. 2010).

sightings. The regional rarity of species was supported with literature references where available, and for species where such references were not available, the species was recorded in the data set as “regionally rare tbc” (tbc meaning “to be confirmed”). It is hoped that the preliminary listing of these potentially regionally rare species (refer to Table 10) will promote discussion, as part of the review process for this project, and may lead to the development of a regionally rare species list and subsequent assessments of regionally threatened and regionally at risk species.

Table 10 Regionally uncommon or threatened species recorded in the Waipa District

Scientific name	Common name	Reference
Anthornis melanura melanura	bellbird	TBC
Mohoua albicilla	whitehead	TBC
Petroica longipes	North Island robin	TBC
Petroica macrocephala toitoi	pied tomtit	TBC
Astelia grandis	swamp astelia	TBC
Brachyglottis kirkii	Kohurangi	DOC *pers comm*.
Mida salicifolia	willow-leaved maire	TBC
Pittosporum cornifolium	tawhirikaro	TBC
Pittosporum kirkii	thick-leaved kohukohu	DOC *pers comm*.
Pseudopanax laetus		TBC
Raukaua edgerleyi	raukawa	TBC
Syzygium maire	swamp maire	Clarkson *et al.*, 2002
Houdinia flexilissima	moth	Corinne Watts pers obs.

6 Results of the Significant Natural Areas Inventory and Assessment

6.1 Significant Natural Areas Inventory

Tables 11 to 15 and Figures 3 and 4 provide a summary of the SNA analysis for the District.

A total of 840 sites (11,736.1 ha) were assessed, with 587 sites identified as SNA, comprising an extent of 10,914 ha. The Waipa District comprises a land area of approximately 147,017 ha. Therefore, only 7.5 % of the district consists of significant natural areas.

In addition to the 587 significant sites, 98 sites (421 ha or 0.3 % of the district) were considered to have a high likelihood of meeting one or more RPS criteria and are therefore “likely to be significant” (Table 11). 75 sites (255.9 ha or 0.2 % of the district) remained with an “indeterminate” significance status, where it was impossible to determine even the likelihood that the site could meet one or more of the RPS criteria, because the vegetation appeared severely degraded and/or the information available was inadequate to discern the vegetation composition of the site. In order to determine whether the "indeterminate" and "likely" sites are significant more information is needed from field surveys or other sources(s), if available.

A further 80 sites (145.2 ha or less than 0.1 % of the district) were considered “not significant” (Table **11**) as there were insufficient ecological values present to trigger any of the 11 assessment criteria.

Many sites assessed for this study are connected or adjacent to each other, thus providing ecological linkages, corridors and/or buffers. While each site was assessed individually for its significance, many of the sites were considered to form an ecological group. In these cases, there is a main, or "parent" site with one or more extensions, or "sub" site(s) that are identified by a lower-case letter at the end of the site number attribute (e.g. WP012a, WP114b, etc.). A description of the site number attribute is provided in Appendix V of this report.

The key results of this study are:

- Of the 10,914 ha of the Waipa District identified as SNA, approximately 5,487.1 ha were considered to be significant at a “National” level, 2,384.3 ha at a “Regional” level and 3,042.5 ha at a “Local” level (Table 11 and Figure 3). None of the identified SNA were considered significant at an “International” level.
- When the number of sites are tallied, the small number of very large “National” sites in relation to the more numerous but smaller sized “Regional” and “Local” sites suggests that larger remnants in the Waipa District are generally more biologically diverse and hence of greater ecological significance (Table 11).
- 140 sites (60% of total SNA area) of all SNAs assessed have been accredited a high confidence level (Table 12). These sites however include Maungatautari Ecological Island and Pirongia Forest Park and therefore cover a large area of 7,037.1 ha. The majority of sites with a high confidence level are of regional (42 sites) or local (66 sites) significance. 380 sites (26 % of SNA area) were assessed with a medium confidence level, most of which were of local significance (207 sites). 320 sites (14 % of SNA area) had a low confidence level and most of those (158 sites) were assessed as being locally significant. Sites that were assessed as indeterminate or likely significant generally had a low confidence level, which indicates that these sites should have the highest priority for field surveys. Appendix IV of this report provides definitions of the three confidence levels for the assessment of each site.
- 444 of significant sites, equating to 4,367 ha or 40 % of the area of SNA, are not protected under statute or covenant, i.e. unprotected (this includes both private and public land).
- The Department of Conservation administers approximately 23 % (2,506.2 ha) of the total area identified as SNA. This includes 11 small sites (covering a combined area of 16.4 ha) that are protected as DOC Marginal Strips, DOC Historic Reserves and DOC Recreation Reserves. While these areas are protected, this status may not guarantee adequate protection for biodiversity values.
- Some 2,716.6 ha (25%) of SNA fall within various WPDC reserves (Table 13).
- Protected, privately owned SNA equate to some 493.4 ha (4.5 %), comprising 435.2 ha of QEII National Trust Open Space covenants and 58.2 ha of WPDC Environmental Protection Lot covenants (Table 13).
- The main proportion of SNA (74 %) is comprised of indigenous forest followed by manuka and/or kanuka scrub (approximately 10 %).
- The two large remaining tracts of indigenous forest in the Waipa District – Maungatautari Ecological Island and a part of Pirongia Forest Park – provide stronghold habitat for many threatened fauna and flora species, such as long-tailed bats and bush falcon.
- Only 104 ha, or 0.9 % of the SNA area in the Waipa District, contain remnant freshwater wetland vegetation (i.e. they have been identified as "herbaceous freshwater vegetation" in the BIOVEG data), and 60 % of these areas are found on unprotected land.

Table 11 Summary of relative significance levels of SNA of the Waipa District by number and area (hectares)

Significance Level	Number of Sites	Area (ha)	% of total SNA area
National	19	5,487.1	47%
Regional	137	2,384.3	20%
Local	431	3,042.5	26%
Subtotal for significant sites	***587***	***10,914***	***93%***
Likely	98	421.1	4%
Indeterminate	75	255.9	2%
Not significant	80	145.2	1%
Total	**840**	**11,736.1**	**100%**

Table 12 Summary of confidence levels and relative significance, shown in number of sites and area (hectares)

Confidence level	Significance level	Area (ha)	Number of sites	% of total SNA area
High	National	5,304.4	12	45%
	Regional	1,108.0	42	9%
	Local	494.3	66	4%
	Likely	94.1	3	1%
	Indeterminate	0.8	1	0%
	Not significant	35.4	16	0%
	High Total	**7,037.1**	**140**	**60%**
Medium	National	69.2	6	1%
	Regional	1,049.7	76	9%
	Local	1,654.9	207	14%
	Likely	141.0	42	1%
	Indeterminate	91.2	22	1%
	Not significant	52.7	27	0%
	Medium Total	**3,058.7**	**380**	**26%**
Low	National	113.5	1	1%
	Regional	226.6	19	2%
	Local	893.3	158	8%
	Likely	185.9	53	2%
	Indeterminate	163.9	52	1%
	Not significant	57.1	37	0%
	Low Total	**1,640.3**	**320**	**14%**
Grand Total		**11,736.1**	**840**	**100%**

Table 13 Summary of protected SNA of the Waipa District by protection type and relative significance levels (excluding sites with indeterminate protection status), shown in area (hectares)

Significance Level	QEII sites	DOC Cons. Units	WPDC covenants	WPDC reserves (incl some DOC land)	WPDC reserves (less DOC land)
National	83.8	1,933.3	0.0	4,347.2	2,603.4
Regional	349.1	525.6	57.2	558.5	63.4
Local	2.3	3.8	1.0	36.1	35.1
Likely	0.2	3.8	0.0	10.8	10.8
Indeterminate	0.0	0.0	0.0	2.6	2.6
No	0.0	0.0	0.0	1.3	1.3
TOTAL	**435.2**	**2,506.2**	**58.2**	**4,956.4**	**2,716.6**

Table 14 Summary of ecosystem types and relative significance levels, shown in number of sites and area (hectares)

	Number of sites	Area in hectare
Terrestrial Vegetation		
National	8	5,216.0
Regional	116	2,186.5
Local	369	2,371.1
Likely	66	263.6
Indeterminate	55	202.0
Not Significant	75	135.6
Total	**689**	**10,374.9**
Wetland - Freshwater		
National	2	134.5
Regional	8	25.3
Local	27	175.5
Likely	8	39.2
Indeterminate	2	11.9
Total	**46**	**386.4**
Multiple		
National	9	136.7
Regional	13	172.6
Local	35	495.9
Likely	24	118.2
Indeterminate	15	33.6
Not Significant	5	9.5
Total	**101**	**966.5**
Indeterminate		
Indeterminate	3	8
Total	**3**	**8**
Grand Total	**840**	**11,736.1**

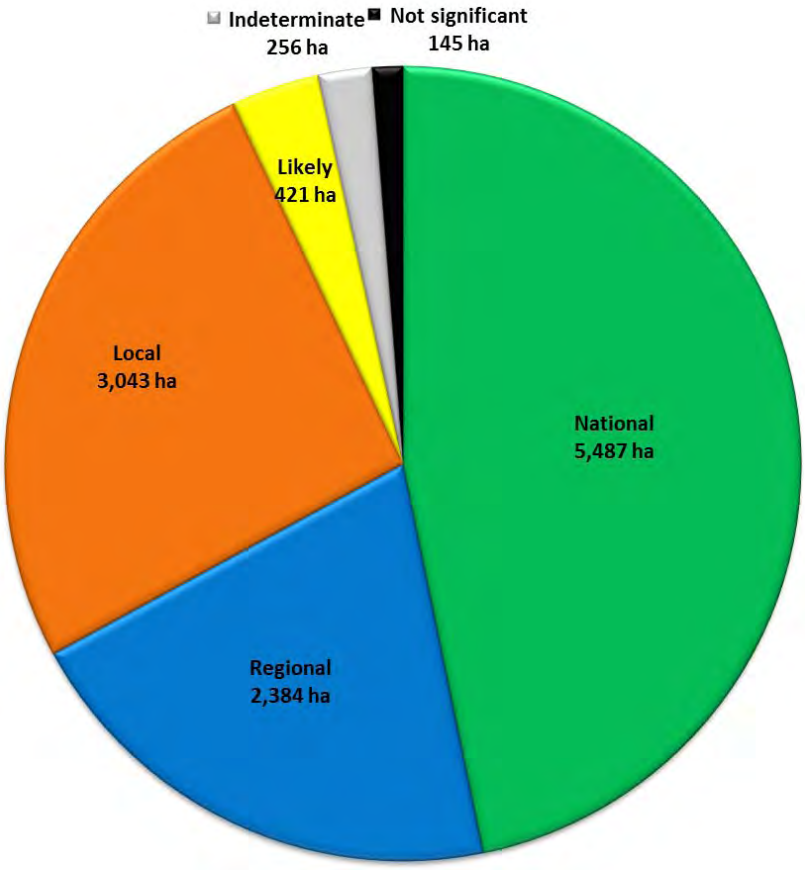

Figure 3 Distribution by area (hectares) of the relative significance of SNA of the Waipa District

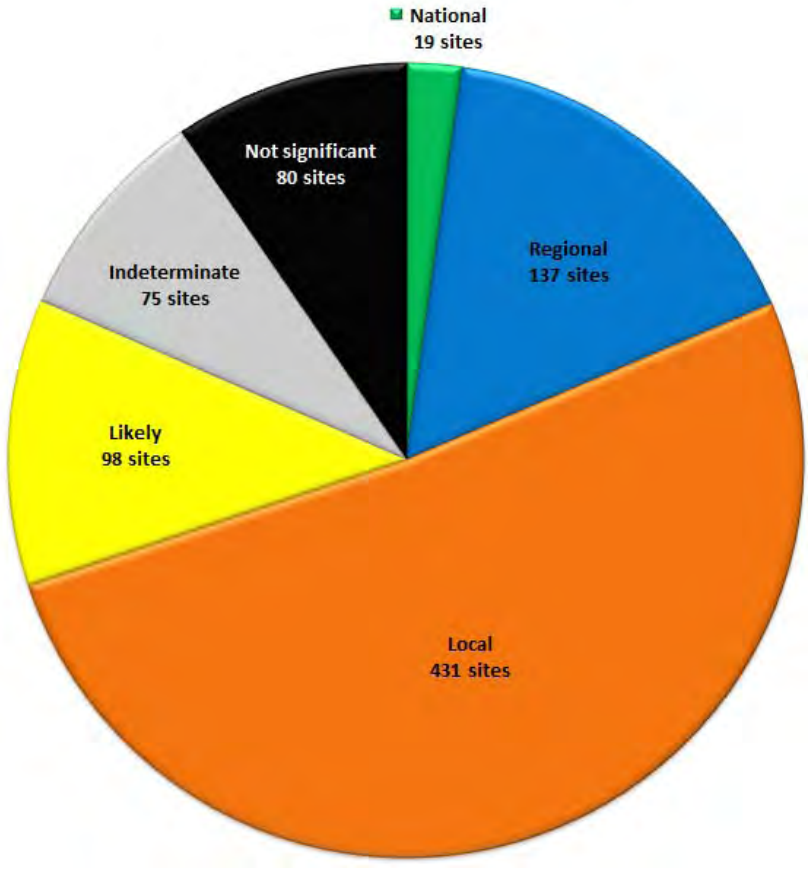

Figure 4 Distribution by number of sites of the relative significance of SNA of the Waipa District

6.2 Vegetation Composition Analysis

The total area mapped as indigenous vegetation in the BIOVEG layer is 10,921.44 ha. Table 15 shows that an area of 10,338.97 ha was assessed as SNA, which equates to 94.7 % of the total area of indigenous vegetation. The remaining 5.3 was considered either not significant or indeterminate.

When the data is analysed in terms of vegetation composition for the identified SNA, it becomes apparent that a reasonable majority (6,039 ha, 68 %) of the mature indigenous forest types remaining in the Waipa District are legally protected, primarily in WPDC reserves (i.e. Maungatautari Ecological Island) or DOC administered reserves (Table 13). This equates to 55 % of the entire SNA area, and is quantified from the amalgamation of the "Broadleaved Indigenous Hardwoods" and "Indigenous Forest" BIOVEG classes[6]. Surprisingly, 2,911 ha (26 %) of the mature indigenous forest types remaining in the Waipa District are not legally protected. These unprotected areas are often in a severely degraded and/or fragmented state.

An analysis of the "Manuka and/or Kanuka" and "Deciduous Hardwoods" (i.e. willow wetlands) BIOVEG classes found that these types are primarily on unprotected land. Expressed in area, that is 759.52 ha (66 %) of the total area mapped as "Manuka and/or Kanuka" and 533.86 ha (84 %) of the total area mapped as "Deciduous Hardwoods". Scrubland ecosystems such as "Manuka and/or Kanuka", as well as willow wetlands can provide habitat for many threatened fauna species, such as lizards and black mudfish.

6.3 Limitations of the Assessment

This "desktop" study has formed an extensive yet provisional inventory and assessment of SNA of the Waipa District. It is expected that this data will be added to and updated over time through activities such as further field surveys and community consultation. To this effect, validation through "ground truthing" (i.e. field surveys) is essential. Every opportunity should be taken to add to or update information contained in this SNA data set where new information becomes available.

The accuracy of the spatial boundaries of the sites in the data set is dependent on the data from which the boundaries are derived. In general, the positional accuracy can be considered to be within /- 30 m, which is the level of accuracy of the BIOVEG data, the primary source from which the majority of site boundaries were derived.

Only areas comprised of indigenous terrestrial and freshwater wetland vegetation were assessed as part of this inventory. Other ecosystem types are assessed as part of other projects, notably freshwater lakes and riverine ecosystems, and data from those projects may be aggregated with this data at a later stage, if feasible. This would be especially valuable for the streams within the Waipa District, whose ecological values were not assessed for this study.

Wetlands have been problematic to identify from the aerial photography and many will need to be field checked. In addition, there are likely to be some wetlands that have not been identified due to the limitations of identifying this ecosystem type in aerial photography when they are situated within an already densely forested locality or underneath a willow canopy.

[6] Derived from Waikato Regional Council Biodiversity Vegetation (BIOVEG) data dated 2007. Copyright Reserved.

Table 15 Distributions (ha) of vegetation composition (as expressed in BIOVEG classes[7]) of SNA of the Waipa District

Vegetation Type	SNA area	Unprotected areas	Protected areas	DOC land	QEII covenants	WPDC 2.2.1 covenants	WPDC reserves
Broadleaved Indigenous Hardwoods	823.85	370.99	452.87	299.98	4.53	3.67	144.69
Fernland	146.44	65.31	81.13	59.54	3.34	0.00	18.24
Herbaceous Freshwater Vegetation	103.81	62.76	41.06	31.09	4.72	0.75	4.50
Indigenous Forest	8,126.35	2,540.36	5,585.99	1,852.55	300.96	28.68	3,403.80
Manuka and or Kanuka	1,138.52	759.52	379.00	303.09	48.78	0.00	27.13
Sub Total Indigenous Vegetation	**10,338.97**	**3,798.93**	**6,540.04**	**2,546.26**	**362.34**	**33.09**	**3,598.36**
Deciduous Hardwoods	632.31	533.86	98.45	9.69	3.30	13.62	71.85
Gorse and Broom	26.03	13.32	12.70	0.00	5.26	6.07	1.38
Other Exotic Forest	5.54	5.50	0.04	0.04	0.00	0.00	0.00
Pine Forest - Closed Canopy	3.80	0.00	3.80	0.21	2.42	1.18	0.00
Pine Forest - Open Canopy	0.55	0.00	0.55	0.00	0.55	0.00	0.00
Uncertain	33.30	31.13	2.17	0.00	2.17	0.00	0.00
Sub Total Exotic Vegetation	**701.53**	**583.81**	**117.73**	**9.94**	**13.70**	**20.86**	**73.22**
Grand Total	**11,040.50**	**4,382.74**	**6,657.77**	**2,556.20**	**376.04**	**53.95**	**3,671.58**

Note that not all areas identified as SNA were derived from the BIOVEG data, and therefore the total area of SNA in this table is slightly less than the total area of SNA described elsewhere in this report.

[7] Derived from Waikato Regional Council Biodiversity Vegetation (BIOVEG) data dated 2007. Copyright Reserved.

7 Conclusions and Recommendations

7.1 Conclusions

This survey confirms the fact that the extent and size of indigenous vegetation and habitats of indigenous fauna are severely under-represented within the Waipa District, with only 7.5 % of the Waipa District still containing indigenous vegetation. This compares poorly with many other Territorial Authorities within New Zealand, highlighted by the fact that only 0.29 % of New Zealand's Nationally Threatened Vegetation units are within Waipa (Walker *et al.*, 2005). Primary forests (3.1 % of their original estimated extent) and wetlands (0.2 % of their original estimated extent) are particularly under-represented within the District (Leathwick *et al.*, 1995). Despite this, there are still prominent and ecologically significant natural features remaining within the Waipa District (Figure 2):

- the three bush clad peaks of Pirongia, Kakepuku and Maungatautari;
- the peat lakes of the central plains between Hamilton and Te Awamutu;
- The Waipa and Waikato Rivers; and
- The remnant restiad peat bog – Moanatuatua.

A summary of some of the key results of this study includes:

- A total of 840 sites were assessed. 587 sites were identified as SNA, covering some 10,914 ha. 98 sites were considered likely to be significant, 80 sites were considered not significant as they did not contain any significant ecological values and therefore did not meet any of the 11 RPS criteria, and 75 sites remained with an indeterminate significance status, because the vegetation appeared severely degraded or it was impossible to determine the vegetation composition and other ecological values from the aerial photography or from any other available information, and a field check was recommended.
- Of the 587 SNA identified, well over 70 % (431 sites) were considered to be significant at a "Local" level. However, these sites only cover 28 % of the area that was identified as significant, while the 19 sites of "National" significance cover 50 % of the area and 22 % of the area (137 sites) was significant at a "Regional" level.
- 444 of significant sites, equating to 4,367 ha or 39 % of the area of SNA, are not protected under statute or covenant, i.e. unprotected (this includes both private and public land).
- The main proportion of SNA (74 %) is comprised of indigenous forest followed by manuka and/or kanuka scrub (approximately 10 %).
- Of the 10,914 ha of the Waipa District identified as SNA, approximately 5,487.1 ha were considered to be significant at a "National" level, 2,384.3 ha at a "Regional" level and 3,042.5 ha at a "Local" level. None of the identified SNA were considered significant at an "International" level.
- When the number of sites are tallied, the small number of very large "National" sites in relation to the more numerous but smaller sized "Regional" and "Local" sites suggests that larger remnants in the Waipa District are generally more biologically diverse and hence of greater ecological significance (Table 11).
- 444 of significant sites, equating to 4,367 ha or 40 % of the area of SNA, are not protected under statute or covenant, i.e. unprotected (this includes both private and public land).
- The Department of Conservation administers approximately 23 % (2,506.2 ha) of the total area identified as SNA. This includes 11 small sites (covering a combined area of 16.4 ha) that are protected as DOC Marginal Strips, DOC Historic Reserves and

DOC Recreation Reserves. While these areas are protected, this status may not guarantee adequate protection for biodiversity values.

- Some 2,716.6 ha (25%) of SNA fall within various WPDC reserves (Table 13).
- Protected, privately owned SNA equate to some 493.4 ha (4.5 %), comprising 435 ha of QEII National Trust Open Space covenants and 58.2 ha of WPDC Environmental Protection Lot covenants (Table 13).
- The main proportion of SNA (74 %) is comprised of indigenous forest followed by manuka and/or kanuka scrub (approximately 10 %).
- The two large remaining tracts of indigenous forest in the Waipa District – Maungatautari Ecological Island and a part of Pirongia Forest Park – provide stronghold habitat for many threatened fauna and flora species, such as long-tailed bats and bush falcon.
- Only 104 ha, or 0.9 % of the SNA area in the Waipa District, contain remnant freshwater wetland vegetation (i.e. they have been identified as "herbaceous freshwater vegetation" in the BIOVEG data), and 60 % of these areas are found on unprotected land.
- While some SNA have low vegetation values and are compromised by weeds and animal pests, they can provide habitat for a diverse range of indigenous fauna, including important breeding habitat for nationally threatened species – notably long-tailed bats.
- Scrubland and willow wetlands vegetation types are found primarily within unprotected private land. Scrubland and willow wetlands, can provide habitat for many threatened fauna species, such as long-tailed bats, lizards and black mudfish, as well as threatened wetland plants.
- A total of 73 nationally threatened species (24 flora species and 49 fauna species) have been recorded as being present within the Waipa District. While some of these species are found solely within Maungatautari Ecological Island, others are widespread throughout the district. Cryptic fauna species, such as the Hochstetter's frog and North Island long-tailed bats, are regularly being discovered in new sites and habitats with improved survey methods and technology as ecological investigations for resource consents or scientific research are conducted. Species threat classifications are regularly reviewed and updated. The SNA database needs to be regularly updated to reflect new spatial data and changes in threat classification.
- Walker et al. (2005) have calculated that 1,106 ha of the Waipa District contain indigenous habitat that is presently nationally threatened, and 1,989 ha of habitat within Waipa District is under-protected from a nation-wide perspective. These statistics highlight that nationally threatened vegetation types are under-represented and not well protected within Waipa District.

7.2 Recommendations

7.2.1 Key Issues

The key issues which pertain to habitats of indigenous vegetation and fauna as well as maintaining biodiversity within Waipa are:

1. How to ensure that the remaining vegetation in the flat lands of Waipa is protected from stock access and weeds.
2. How to ensure intensive landuse practices adjacent to the Waipa Peat Lakes do not cause further clearance, weed intrusion and drainage.
3. How to ensure that the ecological values of the forests and scrublands of the western hills of Pirongia and Kapamahunga and around Maungatautari are retained.

4. How to control animal pests that continue to degrade the indigenous fauna and flora habitats of the District.
5. How to recreate ecological links between the hill country and the wetlands, rivers and lakes and lowland habitats of the District.
6. Providing continued ongoing and financially sustainable support for existing community restoration initiatives.
7. Providing protection and restoration of habits of key threatened species in a degraded, fragmented habitat – notably long-tailed bats.

7.2.2 Ecological Restoration Priorities for the Waipa District

There are many successful restoration projects throughout the Waipa District, of which a large proportion are run by the community or private individuals, or jointly between local communities/individuals and government organisations. Clarkson *et al.* (2006) lists the restoration priorities for the Waikato Region as:

- establish mountain to sea corridors of both terrestrial and aquatic ecosystems;
- reconnect fragmented ecosystems (on land and via waterways);
- return species that have been lost from the area, such as kiwi;
- buffer the edges of wetlands, rivers, lakes, geothermal areas, springs, coastal cliffs, dunelands, estuaries, and fragmented forest;
- establish pest-free areas on islands and on the mainland to act as refuges and nurseries for native species; and
- reconstruct ecosystems currently removed from or now rare in the region.

Most of these restoration priorities are generally applicable to the Waipa District. Restoration needs to recreate the structural and functional integrity of a degraded ecosystem as well as restore its species composition (Clarkson *et al.,* 2006).

Removal of existing habitat, even severely degraded habitat, is the most significant limitation on restoration projects, as “green-field” restoration is difficult and expensive to undertake and may take much longer to create a similar level of biodiversity than that found in even a severely degraded natural feature. Loss or removal of key species, such as seed dispersing kereru or mature fruiting canopy trees, is also a primary limitation to achieving successful restoration. Grazing of wetland and forest fragments by stock and animal pests will destroy most regenerating trees and shrubs and, over time, open up canopies and introduce weeds and grass.

Predation of native animals by introduced species such as possums, rats, cats, dogs and mustelids can quickly decimate local populations. Animal pest control is particularly important given that some threatened fauna species that are vulnerable to predation are still present in the Waipa District. In some habitats (such as wetlands where many threatened birds, lizards and invertebrates are found) control of predatory animals is the core restoration requirement.

Restoration, is therefore, not merely a matter of replanting a fragment and leaving it to "do its thing”, but involves a long-term management programme, which includes permanent stock exclusion, controlling animal pests, controlling weeds and ideally securing some type of legal protection, such as covenanting, to protect the investment. Nonetheless, replanting with appropriate indigenous species is usually central to any restoration project (Amoore & Denyer, 2007).

In many cases, ecological restoration can have wider community benefits. For example, Maungatautari Ecological Island, the Pirongia Te Aroaro O Kahu Restoration Society - Mangakaraa catchment and Mount Kakepuku pest control programmes are long-term restoration projects that protect under-represented habitats and a large number of nationally threatened flora and fauna species. In addition, these restoration projects have resulted in significant environmental education and regional tourism benefits.

While this inventory has not assessed stream or river ecosystems, many of the SNA do contain, or are adjacent to, freshwater ecosystems with significant ecological values. For example, the wetlands surrounding the peat lakes, while significant in their own right, also inter-relate with the functional and compositional values of the lake ecosystem itself. These linkages are very important for maintaining the lifecycles of many indigenous species, such as freshwater invertebrates, native fish and waterfowl.

The following list provides a summary of the habitat types, or ecological "Hot Spots" under the greatest threat for each ecological district (ED) in the Waipa District and hence where the most scientifically appropriate opportunities for protection and restoration lie:

- Hamilton ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the lower slopes of Pirongia and the Kapamahunga Range.
  - ⇒ Gully wetlands, secondary growth forest and scrublands of the Waipa and Waikato Rivers and their tributaries.
  - ⇒ Any still unprotected margins of peat lake or peat bog habitat including pasture dominated buffer margins.
  - ⇒ Habitat for long-tailed bats.
- Waipa ED:
  - ⇒ Kahikatea dominated alluvial plain forest.
  - ⇒ Logged tawa and podocarp forest and kanuka scrubland on hill-slopes.
  - ⇒ Gully wetlands and scrublands along the Waipa River and its tributaries.
  - ⇒ Habitat for long-tailed bats.
- Maungatautari ED:
  - ⇒ Logged tawa and podocarp forest and kanuka scrubland surrounding the lower slopes of Maungatautari as well as in the vicinity of Te Miro and Whitehall and Buckland.
  - ⇒ The riparian margins scrublands, backwater wetlands and regenerating forest of the Waikato River and its tributaries.
- Kawhia ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the lower slopes of Pirongia.
  - ⇒ Gully wetlands and forest/scrublands along the tributaries of the Waipa River.
- Ranginui ED:
  - ⇒ Logged tawa and podocarp forest fragments.
  - ⇒ Scrub margins of the Waikato River, Puniu River and their tributaries.
- Raglan ED:
  - ⇒ Logged tawa and kohekohe forest and kanuka scrubland on the slopes of the Kapamahunga Range.

The general extent of these ecological "Hot Spots" within Waipa District and their associations with the rivers, lakes and streams that still have some functional riparian and ecological corridor functions, are shown below in Figure 5, which gives a graphical indication of where restoration and protection priorities could be targeted.

This project is limited to the identification and assessment of areas of vegetation and habitats for indigenous fauna that are comprised primarily of indigenous vegetation and are over 0.5 ha in size. It is acknowledged that significant habitats for indigenous fauna do exist outside of areas of

indigenous vegetation (e.g. long-tailed bats in exotic tree stands; black mudfish populations in highly modified drains and willow wetlands). It is also important to bear in mind those wetlands and terrestrial remnants under 0.5 ha which have not been mapped or assessed in this study. This does not imply that as yet to be identified areas, even those under 0.5 ha or exotic vegetation providing habitat for threatened species, are not significant. In some cases they may well be ecologically significant and trigger the RPS criteria. We recommend that the Council consider a future project to assess significant habitat for indigenous fauna in exotic vegetation. Also, it would add value to the database if the ecological significance of sites smaller than 0.5 ha or that have not been previously identified are assessed as they come to light.

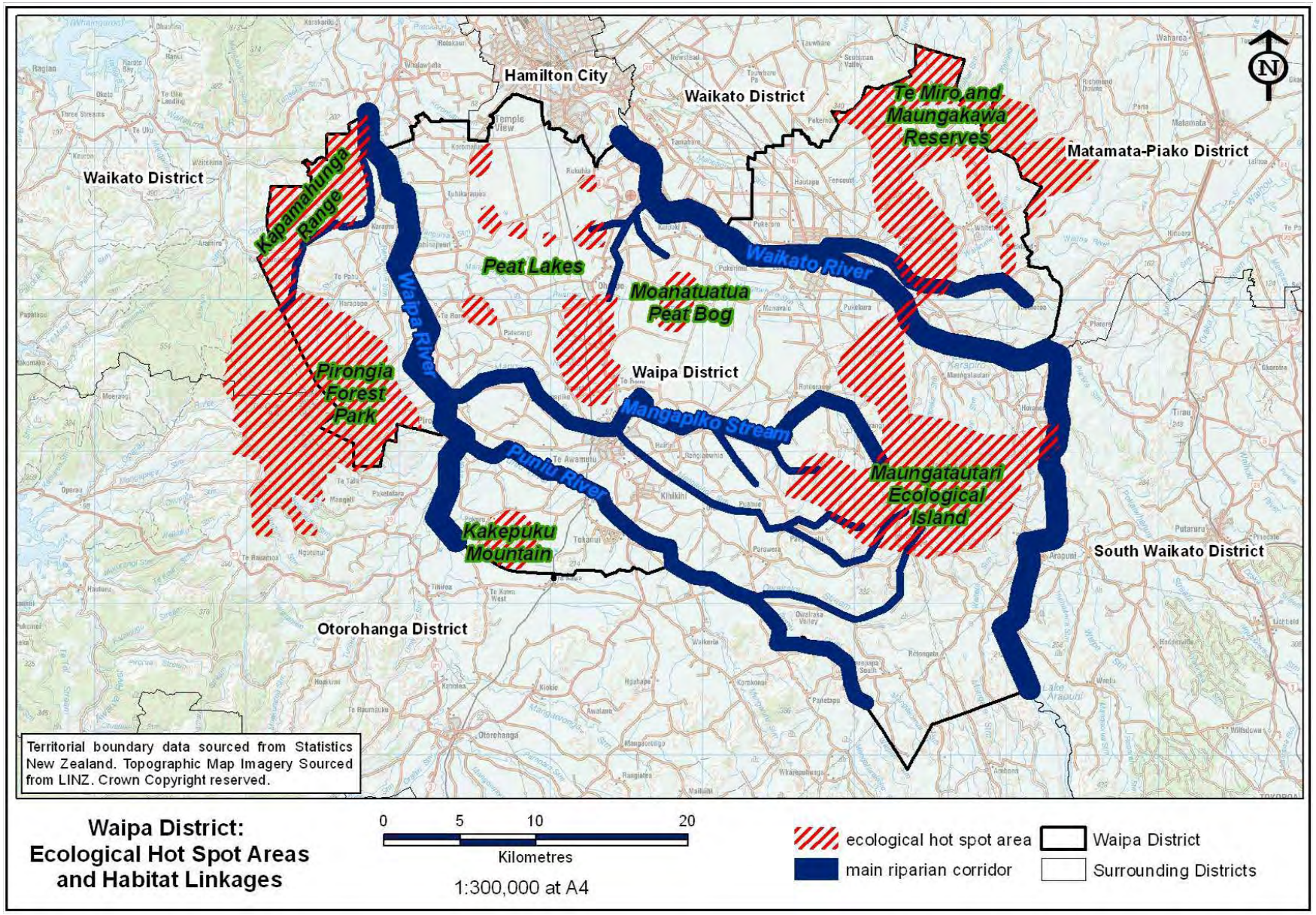

Figure 5 Key Ecological "Hot Spots" and Functional Riparian Corridors within Waipa District

Acknowledgements

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Department of Conservation staff were always willing to share crucial knowledge, particularly for threatened species, and provided a very thorough and useful review of the final draft.

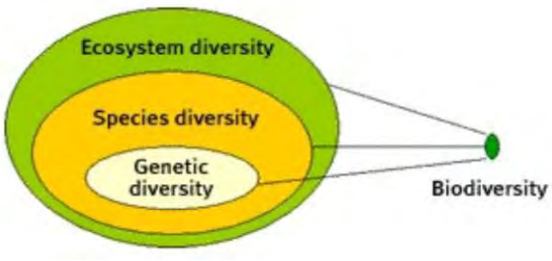
Glossary

At risk: This means a species facing a longer-term risk of extinction in the wild (either because of severely reduced or naturally small population size or because the population is declining but buffered by either a large total population or a slow rate of decline) as identified in the New Zealand Threat Classification System lists.

Biodiversity (or biological diversity): Section 2 of the Resource Management Act 1991 (RMA) provides a definition for biodiversity: “the variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems”; and/or is simply a way of defining the variety of life on Earth. This includes the different:

- types of animals, birds, fish, insects, plants, bacteria and other species;
- characteristics within a species, for example, how one giant skink differs from another;
- ways species live together, for example, how wood pigeons help to sow seeds;
- types of places species live together, for example, kauri forest or streams;
- ways in which species interact with their environment, for example, kahikatea forest likes to be seasonally flooded. the composition and abundance of species and communities in an ecosystem; and
- ‘engines’ that makes ecosystems work; e.g. the energy links which drive the interactions between trees, insects, birds and fish.

Biodiversity can be represented at three different levels as shown below:



(from MfE web site, 2003)

Biodiversity is also about New Zealand's biological wealth. Much of our economy is based on the use of biological resources and we benefit from the "services" provided by healthy ecosystems. These include providing raw materials, purifying water, decomposing waste, cycling nutrients, creating and maintaining soils, and regulating climate.

Bioveg: The short name for a Waikato Regional Council data set called "Biodiversity Vegetation". Information about this data set can be viewed at this web address: http://www.waikatoregion.govt.nz/Environment/Environmental-information/REDI/1652753/

Ecology: (from Greek: οἶκος, oikos, "house, household, housekeeping, or living relations"; -λογία, -logia, "study of") Ecology is the interdisciplinary scientific study of the interactions between organisms and the interactions of these organisms with their environment.

Ecological district: A local part of New Zealand where the features of geology, topography, climate and biology, plus the broad cultural pattern, inter-relate to produce a characteristic landscape and range of biological communities unique to that area. In New Zealand, 268 ecological districts have been identified and mapped (at 1:500,000 scale; McEwen, 1987).

Ecosystems: Are communities of living things (animals, plants, fungi, bacteria and other micro-organisms) that interact with each other and their physical environment (soil, rock, minerals, air, water, temperature, salinity). The roles of the animals and plants, and their abundance, are inseparably bound up with the numbers of other organisms and the amounts of materials available, and with the kinds of physical forces acting at any time. There are ceaseless exchanges of materials, and of energy between living things and their environment, following cyclic pathways which are perpetually repeated, for example the carbon and nitrogen cycles. These cycling systems are characteristic of ecological systems, or ecosystems for short; and/or an interacting system of living and non-living parts such as sunlight, air, water, minerals and nutrients. Ecosystems can be small and short-lived, for example, water-filled tree holes or rotting logs on a forest floor, or large and long-lived such as forests or lakes.

Endemic species: An endemic species is one that exists naturally in a particular environment or location (e.g. New Zealand), and does not exist naturally anywhere else.

Exotic species/Introduced species: A plant or animal species that has been brought to New Zealand by humans, either by accident or design. A synonym is 'Introduced species'.

Habitat: A habitat (which is Latin for "it inhabits") is an ecological or environmental area that is inhabited by a particular animal and plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilized by) a species population.

Indeterminate: Not able to be determined, defined or described accurately due to a lack of information.

Indigenous species: A plant or animal species that occurs naturally without the assistance of humans in New Zealand. A synonym is 'native'.

Indigenous vegetation: Any local indigenous plant community containing throughout its growth the complement of native species and habitats normally associated with that vegetation type or having the potential to develop these characteristics. It includes vegetation with these characteristics that has been regenerated with human assistance following disturbance, but excludes plantations and vegetation that have been established for commercial purposes.

Protected Natural Area (PNA)**:** This is defined as an area of land that has formal legal status intended to protect indigenous ecosystems, vegetation, habitats, or species. Within the PNA network, different types of legislation provide different levels of protection.

Protected: This means the site is on private and/or public land and/or water that is legally protected by statute or covenant (e.g. under the Conservation Act 1987, Reserves Act 1977, etc.) and/or other type of legal protection. A list and categorisation of protection types that were applied for the Waipa SNA is included in Appendix III.

SNA: The short term for Significant Natural Areas. SNA means "...areas of significant indigenous vegetation and significant habitats of indigenous fauna" as defined in (Section 6(c) of RMA). Waikato Regional Council is identifying at the regional scale areas that meet one or more of the criteria in the operative Waikato Regional Policy Statement Appendix III as Significant Natural Areas.

Terrestrial ecosystems: Terrestrial ecosystems can be defined in the most general of terms as the various communities of organisms that inhabit the land in interaction with their environment. In the context of this project, terrestrial ecosystem types are permanently or intermittently dry areas with emergent vegetation dominated by forest, scrub and/or shrubland, or tussock land.

Threatened Species: A species faces a very high risk of extinction in the wild and includes nationally critical, nationally endangered and nationally vulnerable species as identified in the New Zealand Threat Classification System lists.

Threat Status: National Threat classification systems for ranking threatened species.

Unprotected: This means the site is on private and/or public land and/or water where there is no legal protection status. If it is unknown whether they are protected or not, then it is "indeterminate"

Wetland: Permanently or intermittently wet areas, shallow water and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions (Resource Management ACT 1991). The vegetation may be exotic and/or native woody plants such as willows or manuka, and/or herbaceous plants such as sedges, rushes, raupo (*Typha)*, or mosses such as Sphagnum. "Willow wetlands" are wetland areas with a canopy dominated by exotic willows, but often contain native vegetation beneath the willows.

Definitions are primarily sourced from:

Ministry for the Environment. 2000. *The New Zealand Biodiversity Strategy*. Ministry for the Environment. New Zealand.

Ministry for the Environment & Department of Conservation. 2011. *Proposed National Policy Statement on Indigenous Biodiversity.* Retrieved from http://www.mfe.govt.nz/publications/biodiversity/indigenous-biodiversity/proposed-national-policy-statement/index.html

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APPENDIX I - Key Natural Areas Data and Literature for the Waipa District

Waikato Regional Council
Resource Consents Applications Database (RUAMS)
Property Information (LAND)
Waikato Regional Coastal Plan
Areas of Significant Conservation Value (ASCV)
Beadel, S.M.; Shaw, W.B. 2000. Identification of significant natural areas in the Waikato Region using remote sensing and existing databases. Wildland Consultants Ltd Contract Report No. 340. Prepared for Waikato Regional Council. 103 pp.
Department of Conservation
Conservation Management Strategy, Waikato Conservancy (and others).
Waikato Conservancy Threatened Plant Database
Bioweb
Consents Database
Waikato Wetland Database WONI: Ausseil, A.; 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. Discussion document. Landcare Research Contract Report LC0707/158. Prepared for the Department of Conservation.
Directory of Wetlands in New Zealand
Biosites
Priorities Database
DOC Land Information
Brandon, A.; de Lange, P.; Townsend, A. 2004. Threatened plants of Waikato Conservancy. Department of Conservation, Wellington.
Hitchmough, R. (compiler) 2002. New Zealand Threat Classification System lists - 2002. Threatened Species Occasional Publication 23. Department of Conservation, Wellington. 210 pp
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McGuinness, C.A. 2001. The conservation requirements of New Zealand's nationally threatened invertebrates. Threatened species occasional publication no. 20. Department of Conservation, Wellington.
Landcare Research
Fencing and animal pest control data collated by Landcare Research for FRST contract 'UOWX0609 – Forest Remnant Resilience'
Threatened Plants Database
National Vegetation Survey Database
Forest Research Institute Records on Protected Natural Areas
Land Environments New Zealand (LENZ)
Leathwick, J.R.; Clarkson, B.D.; Whaley, P.T. 1995. Vegetation of the Waikato Region: Current and Historical perspectives. Landcare Research contract report LC9596/022. Waikato Regional Council, Hamilton.
NIWA
New Zealand Freshwater Fish Database

Other
Nature Heritage Fund Applications (former Forest Heritage Fund (FHF))
Harding, M. 1997. Waikato Protection Strategy. A report to the Forest Heritage Fund Committee. Published by the Forest Heritage Fund, Wellington.
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Ecological Assessments made for developments applying for consent with WPDC
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Department of Conservation & Ministry for the Environment 2007. Protecting Our Places: Information about the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land. Ministry for the Environment, Publication number ME 805, Wellington.
NZAA 2009. New Zealand Archaeological Association, Site recording Scheme. Date: 5 March 2009
QEII National Trust database (restrictions apply)
WPDC Covenants database
WPDC Reserves database
Miskelly, C.M.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, H.A.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2008. Conservation status of New Zealand birds. *Notornis* 55(3): 117-135.

APPENDIX II - Criteria for the Assessment of Significance of Natural Areas

This appendix contains the following: Appendix 3 of the operative Waikato Regional Policy Statement (RPS) followed by tables from Waikato Regional Council Technical Report No. 2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to Apply Regional Criteria and Determine Level of Significance" (Waikato Regional Council and Wildland Consultants, 2002). Since the formulation of these criteria and guidelines, a new threat classification system for New Zealand has been developed and published (Townsend *et al.*, 2008), and new threat classification lists using this system have been published for bird species (Miskelly *et al.*, 2008), plant species (de Lange *et al.*, 2009), fish species (Allibone *et al.,* 2010) and native bats (O'Donnell *et al.*, 2010). These changes affect the assessment guidelines related to RPS criterion 3. Updated guidelines for assessing RPS criterion 3 and the relative level of ecological significance of SNA based on threatened species have since been formulated by the Council in consultation with Wildland Consultants and Kessels & Associates, and are provided at the end of this appendix. Also, please note that the "Not Sure" response in column D of Tables 1 and 2 is now either "Likely" or "Indeterminate" depending on the information available and confidence in the assessment.

Regional Policy Statement - Appendix 3

Criteria for Determining Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna

Updated November 2002

The following criteria are to be used to identify areas of significant indigenous vegetation and significant habitats of indigenous fauna as they exist at the time the criteria are being applied.

Previously Assessed Site

1. It is indigenous vegetation or habitat for indigenous fauna that has been specially set aside by statute or covenant for protection and preservation unless the site can be shown to meet none of Criteria 3-11.
2. It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund, or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11.

Ecological Values

3. It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:
    - threatened with extinction; or
    - endemic to the Waikato Region.
4. It is indigenous vegetation or habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.
5. It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, Chenier plain, or karst ecosystems.
6. It is wetland habitat for indigenous plant communities and/or indigenous fauna communities that has not been created and subsequently maintained for or in connection with:
    - waste treatment; or
    - wastewater renovation; or
    - hydroelectric power lakes.
    - water storage for irrigation; or
    - water supply storage;

    unless in those instances they meet the criteria in Whaley *et al.* (1995).

7. It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.
8. It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self-sustainability of an indigenous species within a catchment of the Waikato Region and which contains healthy, representative populations of that species.
9. It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because:
    - its structure, composition, and ecological processes are largely intact; and
    - if protected from the adverse effects of plant and animal pests and of adjacent landuse (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time.
10. It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato Region or an ecological district, or is an exceptional, representative example of its type.

Role in Protecting Ecologically Significant Area

11. It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effect

Table 1: Criteria for the Assessment of Significance and Reasons for Why a Site is Significant

A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
SITE PROTECTED OR ASSESSED PREVIOUSLY				
1 It is indigenous vegetation or habitat that has been specially set aside by statute or covenant for protection and preservation, unless the site can be shown to meet none of Criteria 3-11.	This may include sites protected under the Conservation Act, Resource Management Act, or with QEII or NWR. The assumption inherent in this criterion is that legally protected areas have been assessed and deemed worthy of protection. Therefore such sites are assumed to be significant unless challenged, in which case the challenger would have to show that the site does not meet criteria 3-11.	DOC, EW, NWR, QEII, TA.	Y / N / NS	What type of legally protected area is it? e.g. Scenic Reserve, National Park, QEII Covenant. _____ _____

[1] CE = Consultant Ecologist, CRI= Crown Research Institute e.g. Landcare Research or National Institute of Water and Atmospheric Research (NIWA), DOC = Department of Conservation, EW = Environment Waikato , NHF = Nature Heritage Fund, NWR = Nga Whenua Rahui, P = Published reports or maps, QEII = QEII National Trust, TA= Territorial Authority (district or city council), UW = University of Waikato..

A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
2 It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11.	Assumption is as above.	NHF, NWR, QEII	Y / N / NS	What type of legal protection has been recommended? _____ _____ _____
RARE / DISTINCTIVE FEATURES				
3 It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • threatened with extinction, or • endemic to the Waikato Region	Species that are threatened with extinction are indigenous species that have been evaluated and placed within any of the "Threatened" categories under the New Zealand Threat Classification System[2]. Endemic to the Waikato Region, means currently only occurs naturally within the Waikato Region.	CE, CRI, DOC, EW	Y / N / NS	List the threatened species and their threat category, e.g. Nationally Critical, Serious Decline, Range Restricted. _____ _____ _____ List any threatened species that use the site which are international migrants. _____ _____ List any regionally endemic species _____ _____

[1] CE = Consultant Ecologist, CRI= Crown Research Institute e.g. Landcare Research or National Institute of Water and Atmospheric Research (NIWA), DOC = Department of Conservation, EW = Environment Waikato , NHF = Nature Heritage Fund, NWR = Nga Whenua Rahui, P = Published reports or maps, QEII = QEII National Trust, TA= Territorial Authority (district or city council), UW = University of Waikato..

[2] Molloy, J. B. Bell, M. Clout, P. de Lange, G. Gibbs, D. Given, D. Norton, N. Smith, T. Stephens. 2001. Classifying species according to threat of extinction. A system for New Zealand. Biodiversity Recovery Unit, Department of Conservation, Wellington, NZ.

A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
4 It is indigenous vegetation or habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	Maps of ecological districts and regions (McEwen 1987) are available from DOC or EW. A "type" of indigenous vegetation or habitat could refer to a broad unit such as podocarp/tawa-dominant forest, or a more detailed classification and mapping unit such as harakeke (*Phormium tenax*) flaxland. Definitions (and examples) of vegetation/habitat structural classes and vegetation types are provided in Atkinson (1985) and, for wetlands, Clarkson *et al*. (2002). Vegetation types for non-wetland vegetation in the Waikato Region are described in Leathwick *et al*. 1995. Comparison with known or likely original extent may require analysis (e.g. using a Geographic Information System) of current extent and previous extent. Leathwick *et al*. 1995 mapped and described the extent of indigenous vegetation types in 1840 and 1995. Vegetation types are not directly comparable and many vegetation types need to be grouped for comparison with the estimated 1840 extent. Future analysis using frameworks such as Land Environments may enable comparison with vegetation patterns prior to human occupation. In the meantime comparison with the 1840 datum will provide useful information for most vegetation classes.	CE, CRI, DOC, EW, P	Y / N / NS	List under-represented vegetation/habitat type(s) and state whether rare at the national, regional, or ecological district scale? _____ _____ _____ _____

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A. Criteria		B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
5	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon, such as geothermal, Chenier plain, or karst ecosystems.	Geothermal habitats can include geysers, springs, sinter terraces, and hydro-thermally altered soils. They provide habitat for geothermally-influenced vegetation, and heat-tolerant bacteria. Chenier plain is a plain comprising shell ridges with infilled muds and other sediment between the ridges. An extensive area at Miranda provides habitat for international wader migrants. Karst ecosystems are limestone systems, providing habitat for specialist limestone plants (e.g. *Asplenium cimmeriorum, Gymnostomum calcereum*) and fauna (e.g. cave weta). Note that these three examples are not a comprehensive list of nationally uncommon vegetation or habitat types.	CE, CRI, DOC, EW	Y / N / NS	Type of feature: _____ _____ Area: _____ Condition: _____ _____

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A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
6 It is wetland habitat for indigenous plant communities and/or indigenous fauna communities[2] that has not been created and subsequently maintained for or in connection with: (a) waste treatment; or (b) wastewater renovation; or (c) hydro electric power lakes[3]; or (d) water storage for irrigation; or (e) water supply storage; unless in those instances they meet the criteria in Whaley *et al*. (1995).	Wetlands have been severely depleted nationwide, and are recognised as a rare habitat type. The RMA definition of a wetland is: "Wetland" includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions. Wetlands may have fluctuating water levels and the edge of a wetland may be difficult to define but will generally be where wetland plant species (e.g. raupo) are replaced with dryland species (e.g. kanuka). Note that manuka can occur in wetland and dryland habitats. All artificially-created wetlands listed in Criterion 6a-e should also be evaluated using the criteria in Whaley *et al*. (1995), as well as criteria 1-5 and 7-11 in Table 1.	CE, CRI, DOC, EW, P Copies of Whaley *et al*. (1995) can be obtained from EW.	Y / N / NS	Type of wetland habitats/indigenous communities present: _____ _____ _____ _____ _____ Origins of wetland (natural, artificial): _____ _____ Area (ha): _____

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[2] Does not include exotic rush/pasture communities.

[3] Does not include Lake Taupo.

A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
7. It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.	This criterion is not intended to select the largest single example of a habitat type in the Waikato Region. Refer to vegetation maps (e.g. Leathwick *et al*. 1995), to determine which other parts of the Region have similar habitat, and the size of those examples. Refer to natural area inventories (e.g. report by Wildland Consultants Ltd and EPRO Ltd 1999), DOC compilations of Sites of Special Wildlife Importance (SSWI), DOC Conservation Management Strategies for Waikato, Bay of Plenty, Wanganui, Auckland, and Tongariro/Taupo Conservancies, Protected Natural Area Programme reports (e.g. Coromandel PNAP) to help determine the species that are typical of each habitat type.	CE, CRI, DOC, EW	Y / N / NS	Broad habitat types present: _____ _____ Area (ha) Notable flora or fauna: _____ _____ How does the size compare with other similar habitat types in the Region? *e.g. the site is part of one of the largest examples of similar habitat types in the Region.* _____ _____

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A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
8 It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region and which contains healthy, representative populations of that species.	Excluding artificial water bodies, except those created for the maintenance and enhancement of biodiversity or as mitigation for a consented activity. Critical means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas, and migratory pathways. It is likely that sound technical advice will need to be obtained from an appropriately qualified and experienced aquatic ecologist.	CE, CRI, DOC, EW, UW	Y / N / NS	Catchment: _____ _____ Area (ha) or length of habitat: _____ Breeding species present: _____ _____ _____
REPRESENTATIVE EXAMPLES 9 It is an area of indigenous vegetation or habitat that is a healthy, representative example of its type because:	Fencing and pest control would be required for most mainland sites in the Region (irrespective of habitat type).	CE, CRI, DOC, EW, P	Y / N / NS	Rank the following factors High (H), Medium (M) or Low (L): • structural intactness ____ • ratio of indigenous:exotic species ____

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A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
• its structure, composition, and ecological processes are largely intact, and • if protected from the adverse effects of plant and animal pests and of adjacent landuse (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time.	Ecological sustainability means a site's ability to continue to exist as an area of indigenous vegetation or habitat for indigenous fauna when taking into account its size, shape, buffering from external effects, connection to other natural areas, and likely threats. It may change naturally into a different habitat but will remain essentially as indigenous species and of natural character. Ecologists assessing this criterion should take into account the site's size, shape, buffering from external effects, and connection to other natural areas. Other factors to be considered include indigenous regeneration (presence of fruit, seedlings, nests, juvenile animals etc), structural tiers (layers), hydrological processes in wetlands, invasive weeds, pest animals, domestic stock, threat management, management history. Representative areas are sites that are the best examples of sites that form a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (*c.f.* Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' will be the larger and most diverse remaining examples of indigenous vegetation and habitats.	This criterion will require the input of an experienced and qualified ecologist. Good information will be required, and, in most instances, a field visit will be necessary.		• connectivity to other natural areas ____ • size of the area in the context of the relevant ecological district ____ • degree of protection from likely threats (e.g., fenced, buffered) ____ • species diversity ____ List no. of responses to the above questions: H _____ M _____ L _____ Indicate overall ecological quality of the site. _____ Would you consider this to be among the best examples of its type nationally (Y/N), in the Waikato Region (Y/N), or in a particular ecological region/ district (Y/N)? Provide justification. _____ _____ _____

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A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
10 Is it an area of indigenous vegetation or habitat that forms part of an ecological sequence that is either not common in the Waikato Region or an ecological district, or is an exceptional, representative example of its type.	**Ecological sequence** means a series of two or more connected ecosystem or vegetation types that retain natural transition zones along an environmental gradient. Ecological sequences that are not common in the Waikato Region include, but are not restricted to, native dune vegetation through to coastal scrub or forest, lake margins or geothermal systems to native forest, coastal to montane or alpine vegetation. Such sequences should be largely intact (e.g. perhaps bisected by roads but not by large tracts of non-native land cover), such that they can be traversed by the majority of indigenous species that are reliant on such sequences for the completion of part or all of their life-cycles (either by deliberate movement or dispersal of propagules such as seed or pollen). An exceptional, representative sequence will be one of the best examples of its type, taking into account its intactness, composition, and ecological processes. It will probably be necessary to provide or obtain a map(s) of the sequence and the main vegetation types and habitats that it comprises. GIS analysis using a vegetation map and an appropriate evaluation framework (e.g. ecological district boundaries) may demonstrate if a sequence is uncommon or one of the better examples.	CE, CRI, DOC, EW, P	Y / N / NS	Does the site include or is it part of one of the best or only examples of this type of ecological sequence nationally (Y/N), regionally (Y/N), or in the relevant ecological district (Y/N)? Location: _____ Key elements of sequence: _____ _____ _____ _____ _____ Justification: _____ _____ _____ _____

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A. Criteria	B. Definitions and Further information	C. Likely Information[1] Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
ROLE IN PROTECTION OF ECOLOGICALLY SIGNIFICANT AREA				
11 It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor, and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects.	This also includes riparian vegetation that protects a significant aquatic habitat, e.g. a freshwater fishery.	CE, CRI, DOC, EW, P	Y / N / NS	Key ecological function(s) of site (buffer, ecological linkage, other): _____ _____ Which site(s) does this area provide a buffer or linkage for? _____ _____ Which of criteria 1-10 does the buffered or linked site comply with? _____ _____ Justification: _____ _____ _____

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Table 2: Relative Importance of a Significant Area of Indigenous Vegetation or Habitat of Indigenous Fauna

In Column A, circle the criteria numbers for which you scored a 'Yes' in Table 1. Then consider the factors to be assessed, and complete column D, using your answers in Table 1 Col E to justify your response.

A. RPS Criteria met (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
	INTERNATIONALLY SIGNIFICANT A site is Internationally Significant if you respond 'YES' to any of the questions in this section:	**Internationally significant** natural areas have usually been identified in previous assessments. These sites are so important that some of them are already protected by international conventions. For example, the Tongariro National Park is a World Heritage Area, and there are three wetlands in the Waikato listed as Wetlands of International Importance under the international RAMSAR Convention (Whangamarino Swamp, Kopouatai Peat Dome, and the Firth of Thames estuary). Other natural areas may be internationally significant if they contain high quality vegetation or habitat that is unique in the world - for example, geothermal systems at Waiotapu and Orakeikorako. Internationally significant sites are likely to attract the interest of overseas and NZ scientists, and be a primary attraction for international and national tourists, e.g. Miranda bird sanctuary, Tongariro National Park.	
1	Has it been recognised under international legislation or convention as an internationally significant area (e.g. as a World Heritage Site or a RAMSAR site)?		Y / N / NS

A. RPS Criteria met (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
2	Has it been recommended for protection as a World Heritage Site or Wetland of International Importance (RAMSAR site) by QEII or NWH, or NHF?		Y / N / NS
3	Is it currently habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, or Nationally Endangered or Nationally Vulnerable) and endemic to the Waikato Region?		Y / N / NS
3	Is it a key habitat for the completion of the life cycle of species that migrate internationally and that would be threatened if these habitats weren't sustained?	An example of key habitat for international migrants is the Firth of Thames.	Y / N / NS
If meets several of 4 & 9 or 5 & 9 or 6 & 9 or 7 & 9 or 8 & 9 or 10 & 9	Is the site the best or only remaining large representative example in New Zealand of a **suite** of relatively intact indigenous ecosystems and ecological sequences e.g. a wetland/forest complex with altitudinal sequences?	This would need to be justified by several well-qualified and experienced ecologists.	Y / N / NS

A. RPS Criteria (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
	NATIONALLY SIGNIFICANT The site is **at least** Nationally Significant if you can answer 'YES' to any of the questions in this section.	**Nationally Significant** natural areas includes sites that contain healthy populations of threatened species (such as kokako and kaka habitat at Pureora), or are very good examples of nationally rare habitat or vegetation (such as the large wetlands in the northern Waikato). They also include sites that are the only location where certain species occur, such as the hooded orchid at Whangamarino, or the Mercury Islands tusked weta. Nationally significant sites tend to attract the interest of scientists, technical specialists, and/or tourists from other parts of New Zealand.	
1, 2	Is it protected, or recommended for protection, under the Conservation Act 1987 (as an Ecological Area, or Forest Sanctuary), National Parks Act 1980, Marine Reserves Act 1971, or Reserves Act 1977 (as a Nature Reserve or Scientific Reserve).	In the Waikato Region these include: Tongariro National Park, Waihaha Ecological Area, Waipapa Ecological Area, Mangatutu Ecological Area, Rapurapu Ecological Area.	Y / N / NS
3	Is it habitat for an indigenous species which is under serious threat in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, or Gradual Decline?		Y / N / NS
4 **&** 9 or 5 **&** 9 or 6 **&** 9	Is it indigenous vegetation or habitat for indigenous species that is under-represented nationally (10% or less remains), or nationally uncommon (including wetland) that is a good quality example that is representative of its type?	Good quality examples would receive mostly highs or mediums for Criterion 9 in Table 1(taking into account size, presence of plant and animal pests, stock damage, other damaging effects). For the definition of vegetation types refer to Criterion 4 in Table 1 above - Column B, Definitions and Further Information.	List no. of responses to criterion 9 in Table 1: H _____ M _____ L _____ Y / N / NS

A. RPS Criteria (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
	REGIONALLY SIGNIFICANT The site is **at least** Regionally Significant if you can respond 'YES' to any of the questions in this section:	**Regionally significant** natural areas include the best examples in the Waikato Region of habitats that may be common elsewhere in New Zealand - for example, our best dune systems or largest mangrove-filled estuaries, or large examples of more common vegetation types. They may also include examples of nationally rare features that are not in good condition.	
1	Is it protected under the Reserves Act 1977, as a Wildlife Management Reserve, Wildlife Refuge, Scenic Reserve, Nga Whenua Rahui Kawenata, or for any conservation purpose under the Conservation Act such as a Conservation Area or Conservation Park, with significant fauna and/or flora values.		Y / N / NS Status: _____ Recommended Status: _____
1	Is it protected under the Queen Elizabeth the Second National Trust Act 1977 as an Open Space Covenant for any purpose other than those outlined for sites of international or national significance?		Y / N / NS
2	Is it a site that has been recommended for protection by NHF, NWR, or QEII?		Y / N / NS
3	Is it currently habitat for an indigenous species that is threatened, in the categories Sparse or Range Restricted, or endemic to the Waikato Region?	Species currently known to be endemic to the Waikato Region (defined as currently only occurs naturally within the Waikato Region) include: *Sporadanthus ferrugineus*, Mercury Is. Tusked weta, Te Aroha stag beetle, Moehau stag beetle, Hebe 'Awaroa', *Corybas carsei*	Y / N / NS Species: _____ Threat Status: _____

A. RPS Criteria (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
4 & 9	Is it indigenous vegetation or habitat for indigenous species that is under-represented regionally (i.e. within relevant ecological regions and districts) and which is a good quality example that is representative of its type (taking into account size, plant and animal pests, stock damage, other damaging effects)?	Good quality examples would receive highs or mediums for Criterion 9 in Table 1. Assessment must be justified by a well qualified and experienced ecologist.	List no. of responses to question 9 in Table 1: H _____ M _____ L _____ Y / N / NS
4, 5, or 6	Is it a relatively large example of indigenous vegetation or habitat for indigenous species that is under-represented nationally, or nationally uncommon (including wetlands), but which is degraded in quality (taking into account presence of plant and animal pests, stock damage, other damaging effects)?	Assessment must be justified by a well qualified and experienced ecologist. Use the results from Criterion 9 in Table 1 to determine the relative quality of the site.	Y / N / NS
4	Is it the Regions' only remaining representative example (irrespective of its size) of a particular indigenous vegetation type or indigenous species habitat that is degraded in quality?	Representative areas are the best examples of indigenous vegetation and habitats that comprise a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' will be the largest and most diverse remaining examples of indigenous vegetation and habitats. Degraded sites would receive mostly Low scores for the factors listed in Criterion 9.	List no. of responses to question 9 in Table 1: H _____ M _____ L _____ Y / N / NS

A. RPS Criteria (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
9 or 8 & 9 or 10 & 9	Is it one of the best representative examples in the Waikato Region of indigenous vegetation or habitat for indigenous fauna or an ecological sequence?	Assessment must be justified by a well qualified and experienced ecologist.	Y / N / NS
7 & 9	Is it a good quality example of indigenous vegetation or habitat for indigenous species representative of the ecological character typical of the Waikato Region?	This may include examples of indigenous vegetation that are large or moderately large relative to other similar habitats in the region or within the relevant ecological district. They should be relatively intact and retain the main elements of their original composition structure. Examples would include relatively large tracts of indigenous forest and habitats on the Hakarimata Range and Kaimai Range.	Y / N / NS
11	Is it a buffer (or a key part of a buffer) to a site that is of international or national significance?	The site buffered must have first been shown to be of national or international significance using relevant sections above in Table 2.	Y / N / NS

A. RPS Criteria (see Table 1 above)	**B. FACTORS TO BE ASSESSED**	**C. NOTES**	**D. RESPONSE (Yes / No / Not Sure)**
All	**LOCALLY SIGNIFICANT** The site is **at least** of Local Significance if you answered "Yes" to at least one criterion in Table 1 but did not answer "Yes" to any of the questions above in Table 2.	**Locally significant** natural areas are healthy examples of relatively common vegetation and habitat types. They are often small areas, but large enough to enable key ecological processes to occur, such as regeneration of seedlings or reproduction of indigenous fauna. These sites may not be particularly significant in their own right, but nevertheless play an important part in a network of natural areas. For example, a locally significant site might be important as a seasonal feeding or breeding area. It might also act as a stepping stone between other natural areas, allowing indigenous fauna to move in search of food or mates. Such sites are likely to provide representative examples of common or typical vegetation types or habitat for common indigenous species. They will not be among the best examples in the Region but will meet criterion 9 as healthy, functioning, and ecologically viable sites.	Y / N
HOW SIGNIFICANT IS THE SITE?		Circle the highest level for which you allocated at least one "Yes" response in Table 2. This indicates the relative importance of the site.	International, National, Regional, Local

Summary

Crit.	Reason for Significance*	Significance Levels*		
		International	National	Regional
1	Legally protected	RAMSAR or WHS	Ecological Area, Forest Sanctuary, National Park, Marine Reserve, Nature Reserve, Scientific Reserve	Other Reserves Act or Cons. Act. or a QEII covenant
2	Recommended for protection	As a RAMSAR or WHS	As an Ecological Area, Forest Sanctuary, National Park, Marine Reserve, Nature Reserve, Scientific Reserve	As another reserve type under Reserves Act or Cons. Act. or a QEII covenant
3	Threatened species Waikato Endemic species	Acutely threatened species that are endemic to the Waikato	Acutely or chronically threatened species	At risk threat category, range restricted or sparse
		International migrants that would be threatened if habitat was lost		Non-threatened Waikato endemic
4	Under-represented ecosystem	Best*** or only remaining, large example of a suite or sequence of ecosystems. *(For criteria 4, 5, 6, and 10, sites in this category would also be likely to meet a number of other criteria and form a complex of ecosystems.)*	Good quality example of nationally under-represented site (must also meet Crit. 9)	Good quality example of regionally under-represented site (must also meet Criterion 9)
				Relatively large but degraded example of nationally under-represented site
				Degraded, but Region's only remaining example (of any size)
5	Nationally uncommon ecosystem	Best*** or only remaining large example in NZ of a suite of ecosystems	Good quality example of a nationally rare vegetation type (must also meet Crit. 9)	Relatively large but degraded example
6	Wetland habitat	Best*** or only remaining large example in NZ of a wetland type	Good quality example (must also meet Crit. 9)	Relatively large but degraded example
7	Large example of wildlife habitat **	*See notes below***	*See notes below***	Good quality representative example (must also meet Criterion 9)
8	Aquatic habitat **	*See notes below***	*See notes below***	The Region's best or only example of a good quality example (must also meet Criterion 9)
9	Representative example**	*See notes below***	*See notes below***	One of the Region's best examples

Crit.	Reason for Significance*	Significance Levels*		
		International	National	Regional
10	Uncommon or exceptional ecological sequence	Best*** or only remaining large example of a suite or sequence of ecosystems	Good quality example of a nationally rare ecological sequence (must also meet Crit. 9)	One of the Region's best examples (must also meet Criterion 9)
11	Buffer	-	-	Buffers a site that is of national or international significance

Notes for Table

If a site is not of international, national, or regional significance, but meets one of the 11 criteria, it is locally significant.

* Levels of significance are applicable to any site that is part of a larger area that qualifies under any criterion.

** A site that is significant as a large area of wildlife habitat, aquatic habitat or a representative example of its type, will only be of greater than regional significance if it also meets one of the other criteria for which national or international levels apply. For instance, if the site was **also** habitat for acutely threatened species, it would be assessed using Criterion 3 as well as Criteria 7, 8, or 9.

*** Sites that are the 'best' example of their type will also meet Criterion 9. For international significance such sites will also be likely to meet a number of other criteria and must form a complex of ecosystems.

UPDATED SYSTEM FOR EVALUATION OF ECOLOGICAL SIGNIFICANCE IN THE WAIKATO REGION, BASED ON TOWNSEND *et al.* (2008)

Wildland Consultants Ltd 2010, Contract Report No. 2190 (DOCS#1496182).

INTRODUCTION

Since the formulation of the Waikato Regional Council ecological significance criteria and their publication in the Waikato Regional Policy Statement, followed by publication of a technical guide on application of the criteria (Waikato Regional Council and Wildland Consultants, 2002), a new threat classification system for New Zealand has been developed and published (Townsend *et al.,* 2008), and new threat classification lists using this system have been published for bird species (Miskelly *et al.,* 2008) and plant species (de Lange *et al.,* 2009).Changes to the criteria in order to update them to the new threat classification system are presented below.

For species that have not been reclassified in Miskelly *et al.* (2008) or de Lange *et al.* (2009), classifications in Hitchmough *et al.* (2007) should continue to be used within the original criteria set.

SUGGESTED CHANGES TO TABLE 1 (WAIKATO REGIONAL COUNCIL AND WILDLAND CONSULTANTS, 2002)

***Old Text*:**

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- threatened with extinction, or
- endemic to the Waikato Region

***New Text*:**

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- classed as 'Threatened' or 'At Risk' in New Zealand Threat Classification System, or
- classed as 'Data Deficient' in New Zealand Threat Classification System, or
- endemic to the Waikato Region.

or

It is habitat of importance for the conservation of a regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region.

SUGGESTED CHANGES TO TABLE 2 (WAIKATO REGIONAL COUNCIL AND WILDLAND CONSULTANTS, 2002)

Changes below relate to rows of the table where Criterion 3 is referred to in the left-hand column.

Internationally Significant

***Old Text*:**

Is it habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, Nationally Endangered, or Nationally Vulnerable) and endemic to the Waikato Region?

***New Text*:**

It is habitat for an indigenous species (or genetically distinct population) threatened with extinction (in the categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable') and is endemic to the Waikato Region.

or

It is a key habitat for the completion of the life cycle of species (or genetically distinct population) that migrate internationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

For a site to meet the criterion for international significance it must comprise significant habitat for a species (or genetically distinct population) on an international basis. This may include key sites for sustaining populations of international migrants. It must also provide natural habitat (see natural

habitat definition below) for the species (or genetically distinct population), and/or the genetic entity must be indigenous to the site.

Nationally Significant

***Old Text*:**

Is it habitat for an indigenous species which is under serious threat in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, or Gradual Decline?

***New Text*:**

It is habitat used on a regular basis by an indigenous species (or genetically distinct population) in the threat categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable'.

or

It is one of the best quality examples, on a national basis, of habitats used on an ongoing basis by a species (or genetically distinct population) in the At Risk category in the New Zealand Threat Classification System (specifically 'Declining', 'Recovering', 'Relict', or 'Naturally Uncommon')[8].

or

It is a key habitat for the completion of the life cycle of a species (or genetically distinct population), in one of the threat categories above, that migrate nationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions (and are unlikely to be important for the long-term viability of the species) do not meet this criterion. For a site to meet this criterion for national significance, it will be of importance for the viability of the species (or genetically distinct population) on a national basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site.

Regionally Significant

***Old Text*:**

Is it currently habitat for an indigenous species that is threatened, in the categories 'Sparse' or 'Range Restricted', or endemic to the Waikato Region?

***New Text*:**

It is habitat of considerable importance for the conservation of an indigenous species (or genetically distinct population) in the 'At Risk' ('Declining', 'Recovering', 'Relict', and 'Naturally Uncommon') category, or is important habitat for a species that is endemic to the Waikato Region[9].

or

It is habitat of importance for the conservation of regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region, although the species is secure elsewhere. Assessment of whether a species is classified as at risk or threatened in the Waikato Region would have to be justified by several well qualified and experienced ecologists familiar with the species and ecology of the Waikato Region.

or

Habitat considered (by several qualified and experienced ecologists) to be of importance for the sustainability of a 'data-deficient' species on a regional basis.

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[8] Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al*., 2007), based on the Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the best quality examples, on a national basis, of habitats used on a regular basis by a species in the 'Serious Decline' or 'Gradual Decline' categories of the Molloy *et al.* (2002) system.

[9] Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al*., 2007), based on Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the 'Sparse' or 'Range Restricted' categories of the Molloy *et al.* (2002) system.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions and it is unlikely to be important for long-term viability of the species (or genetically distinct population) do not meet this criterion. For a site to meet this criterion for regional significance, the site will be of importance for the viability of a particular species (or genetically distinct population) on a regional basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site. Small populations of threatened plants, not significant on a national basis, but in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, may be placed in this category.

Locally Significant

Data Deficient species will now trigger Criterion 3 in Table 1, therefore some sites, other than those that qualify as being regionally significant (see above), may now be locally significant as a result of providing habitat for Data Deficient species. Otherwise, no changes are necessary for the text of Table 2.

DEFINITIONS FOR WAIKATO RPS CRITERIA

Natural Habitat: Indigenous vegetation or habitats similar to the pre-human environment(s) where the species (or genetically distinct population) was found for key components of its lifecycle. In most instances the site will have undergone adverse changes (e.g. as a result of invasive species, logging, reduction in size or loss of connectivity) but key elements of natural character will remain (site condition may also have improved as a result of intensive control of pest plants and animals). Natural habitat can, in some situations, move across a landscape over time due to natural changes (e.g. volcanism, active dunes, landslides, and geothermal manifestations).

Ongoing Basis: A species (or genetically distinct population) utilises a site for key components of its lifecycle. For fauna, this includes habitats that comprise a key component for its survival, as a food source, breeding ground, roosting site, hibernating site, or site for other key natural behaviours for the species. For plants this would include a site where a species is well-established (i.e. a population is maintained over several years), but it would not include a site where there is only one record of a species which is unlikely to have established permanently at a site. Old records may be important for some biota as many species may only be conspicuous during a particular season or not in every year.

Indigenous to a Site*:* Naturally occurring at the site or reintroduced to a site where it formerly occurred naturally.

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APPENDIX III – Types of Legal Protection in the Waipa District

This appendix lists the possible legal mechanisms, or types of legal protection that have been applied to protect natural areas within the Waipa District. The list is split into two categories: those types that are reasonably expected to have been originally applied for protecting biodiversity values, and those considered indeterminate as to whether they were originally applied for protecting biodiversity values. This is based on the interpretation of RPS criterion 1, which assumes that the biodiversity values of a protected site have been previously assessed and deemed worthy of protection.

1. Legal protection types that, for the purposes of this SNA assessment, were considered reasonably expected to be originally applied for the protection of the biodiversity values of a site. Sites with these legal protected types were assessed as meeting RPS criterion 1:

    Nature Reserve
    Scientific Reserve
    National Reserve / National Park
    Scenic Reserve
    Conservation Park
    Wilderness Area
    Ecological Area
    Sanctuary Area
    Watercourse Area
    Wildlife Management Reserve / Government Purpose Reserve (Wildlife Management)
    Wildlife Refuge / Government Purpose Reserve (Wildlife Refuge)
    Wildlife Reserve / Government Purpose Reserve (Wildlife Reserve)
    Wildlife Sanctuary / Government Purpose Reserve (Wildlife Sanctuary)
    Nga Whenua Rahui Kawenata Covenant
    QEII Open Space Covenant
    WPDC Section 221 Environmental Protection Lot Covenant

2. Legal protection types for which there was a lower confidence of being originally for the protection of the biodiversity values of a site. Sites with these legal protection types were assessed as "indeterminate" for RPS Criterion 1:

    Stewardship Area / Conservation Area
    Recreation Reserve
    Sanctuary Area
    Watercourse Area
    Historic Reserve
    Marginal Strip
    Local Purpose Reserve (Esplanade)

APPENDIX IV - Confidence Levels for Significant Natural Area Assessments

The following table is adapted from Wildland Consultants Contract Report No. 1080 (DOC# 1396563). It lists the definitions and factors that are considered when applying a Confidence Level to the significance assessment of a site.

Confidence Level	Definition
High	High level of confidence in assessment. Ecological information about the site is: • Comprehensive • Reliable • Applicable and/or recent • Site specific Sites with a high confidence rating include: • Relatively large, well-studied, protected areas e.g. Whareorino Forest. • Protected areas that are well known as habitats for threatened species, e.g. Mahoenui giant weta Scientific Reserve, Mapara Scenic Reserve (a habitat for kokako). • Unprotected sites that have been identified as recommended areas for protection in a protected natural areas survey. • Other sites that have been the subject of fauna and/or flora surveys and the information is comprehensive, reliable, recent and site-specific. Sites with a high confidence level have a low requirement for field survey.
Medium	Moderate level of confidence in assessment. Ecological information about the site is: • Relatively comprehensive • Reliable • Not entirely applicable/ recent • More likely to be general than site-specific, e.g. the information applies to a larger tract of indigenous vegetation, of which the site is a relatively small part. Sites with a moderate confidence rating include: • Sites where the assessment is based on ecological information that does not meet all of the criteria for a high confidence level. • Sites that are contiguous with a site that has a high confidence level, and information about the contiguous site is assumed to be applicable to the site that is being assessed. • Sites that have been assessed as nationally or regionally significant on the basis of a record of a single species (such as kereru) without meeting other criteria for national or regional significance. • Sites for which incomplete ecological information exists, and for which targeted surveys may result in records of threatened species. Sites with a medium confidence level have a requirement for field survey.
Low	Low level of confidence in the assessment. Ecological information about the site is not available or is: • Not comprehensive • Unreliable • Out-dated • General Sites with a low confidence rating include: • Very small protected sites e.g. marginal strips. • Unprotected sites within ecological districts where a protected natural areas survey has not been undertaken. • Sites that have met criteria for national significance, solely on the basis of a record of a species (e.g. kiwi, kokako) that is probably extinct at the site. Sites with a low confidence level have a high requirement for field survey.

APPENDIX V – Metadata for the "Significant Natural Areas – "Waipa District" Data set

Identification Information

Data Set Name:

Significant Natural Areas (SNA) – Waipa District Plan Proposed

Please note: this metadata and the SNA GIS layer and attributes may be updated or reconfigured with time as more information becomes available, and as the region's SNA layers become fully standardised between districts.

Data Set Abstract:

This is a provisional desktop based inventory and assessment of the significance of areas of indigenous vegetation and/or habitats of indigenous fauna in terrestrial vegetation, wetland, island (both inshore and offshore), sand dune and shingle beach ecosystems in the Waipa District as at 2007. SNA are commonly referred to as "sites", and one site may consist of a collection of polygons with boundaries derived from vegetation extent and/or cadastral and covenant data depending on the protection status. This SNA data set was originally intended for use in Waikato Regional Council's (the Council) regional biodiversity management prioritisation project, but is available for other Council projects. It may also be used by the Waipa District Council for their planning purposes and by other parties if deemed appropriate.

1291.02@EW.GOVT.NZ
DOCS# 2011952

PLEASE NOTE THE DISCLAIMERS under the "Distribution Information" section of this metadata.

Content of Data Set:

Layers:

GIS_ALL.SNA_WP_DP_PROP (840 Features (sites))

Attributes:

The name and format (in brackets) of each attribute are followed by a short name (if applicable), and complete description. It is mandatory for all attributes to be assessed but 'Can not be NULL'/'Can be NULL' is also recorded (in the brackets) to indicate where NULL is a feasible value due to a lack of data/information. All attributes are recorded and stored in a Microsoft Excel workbook but only key attributes are attached and stored in the spatial database. These need to be periodically updated from the Excel workbook.

+ = it is recommended that only attributes preceded by this character be attached to the SNA_Waipa_2007_Provisional spatial data as required.
[1] = attributes followed by this number were derived and/or completed by Waikato Regional Council.
[2] = attributes followed by this number were derived and/or completed by the ecological contractor.
[3] = attributes followed by this number are available for restricted internal use only and cannot be supplied to external parties without written permission being granted from the Council first.

+SITE_NUMBER**[1]** (Text, Can not be NULL):
An alpha-numeric "number" that is unique for each site. Each site number begins with two letters that refer to the territorial authority where the site is located, e.g. 'WP' for the Waipa District. This is followed by a three digit number, beginning at 001, which follows an

approximate geographical sequence from north-west to south-east throughout the local district. The numbers for sites assessed and added to the data set at a later stage may not follow the north-west to south-east sequence. Many SNA consist of a "parent" site and one or more connected or ecologically related child “sub-sites”, e.g. a single continuous block of indigenous forest that is primarily on a Department of Conservation park or reserve (i.e. the "parent" site), but with smaller contiguous or nearby parts on land that is not legally protected (i.e. the "sub-sites"). In these cases, the "parent" and "sub-sites" may have the same three digit number, but with a lower case alphabetical suffix (e.g. 'a', 'b', 'c', etc.) added at the end of the number(s) of the sub-sites to indicate the ecological connection or relationship to a contiguous or nearby "parent" site. This attribute is not the primary key.

+HISTORICAL_ID[1] (Text, Can be NULL):

This attribute is usually only present if site numbers have changed after the inventory is complete and the data has been supplied to third parties. It is an alpha-numeric "number" that was used as the initial unique site number during the inventory and assessment of SNA in the Territorial Authority and may have changed. This number may have been replaced by the SITE_NO attribute, and is therefore no longer in use.

+SITE_NAME[2] (Text, Can be NULL):

A name for a site:

- If the site is on land that is part of the Department of Conservation (DOC) estate, then the site name may include or be derived from the DOC name for the area;
- If the site is on land that is a reserve administered by a Territorial Authority, the site name may include or be derived from the name of the reserve area;
- If the site is on land that is legally protected as a Nga Whenua Rahui Kawenata covenant, QEII Trust covenant, or other covenant or private protected area, then the site name may include a common name and the general ecosystem or vegetation type of the area, and also the word 'protected';
- If the site is a sub-site then the site name may include the term ‘Extension to [name of legally protected site]' if deemed relevant;
- Otherwise, the site name may be a known common name for the area, or a logical description based on surroundings, or the site name may be Null (i.e. “<null>”).

SITE_DESCRIPTION[2] (Memo, Can not be NULL), short name = SITE_DESCRIP:

This is a brief summary or synopsis of the key characteristics or features of a site. This may include:

- the geography, ecosystem(s) and/or primary type(s) of vegetation in a site;
- whether any significant or important flora and/or fauna are known or likely to occur at a site (particularly threatened species - **NB:** no species names are included, only threat status);
- any other distinct, special or significant features of a site;
- the relationship (if any) of a site to other sites (SNA or other) in the same Territorial Authority, or Ecological District(s), or the Waikato Region.
-

+ECOSYSTEM_TYPE[2] (Text, Can not be NULL), short name = ECOSYS_TYPE:

The primary type, or types, of ecosystem(s) that the site is considered to represent. Further information for this attribute is provided in EWDOCS# 1690354.

- 'Indeterminate' = the ecosystem type(s) that comprise a site could not be determined from the data available.
- 'Island' = the site comprises ecosystems on inshore or offshore islands;
- 'Multiple' = the site comprises two or more main ecosystem types. The ecosystem types may be listed in order from the most to least dominant type by area (e.g. ‘Multiple - Terrestrial Vegetation; Wetland – Freshwater; Wetland – Estuarine’);
- 'Sand Dune' = the site comprises coastal sand dune ecosystems;
- 'Shingle Beach' = the site comprises small areas of coastal beach habitat typically utilised by shorebirds for nesting;

- 'Terrestrial Vegetation' = the site comprises permanently or intermittently dry areas with emergent vegetation dominated by forest, scrub and/or shrubland, or tussock land;
- 'Wetland - Estuarine' = the site primarily comprises permanently or intermittently wet areas with vegetation emergent over shallow or subsurface water directly associated with tidally influenced areas. This does not include floating plants. This could include a mixture of saline and freshwater components.
- 'Wetland - Freshwater' = the site primarily comprises permanently or intermittently wet areas with vegetation emergent over shallow or subsurface freshwater not directly associated with tidally influenced areas (e.g. swamps or bogs). This does not include floating plants. Freshwater wetlands with a canopy dominated by exotic willow species, generally called "willow wetlands", may also be included as these often contain predominantly indigenous understorey freshwater wetland vegetation (Beard, 2010).

+AREA_HA[1] (General Number, Double, 2 decimal places, Can not be NULL):
The estimated area (in NZTM projection) of each site in hectares ±0.01 ha, calculated in GeoMedia 6.1 as true measure (non projected).

+NZTM_EASTING[1] (General Number, Double, 0 decimal places, Can not be NULL), short name = NZTM_EAST:

The NZTM Easting coordinate of the centre of a site (based on the ArcGIS *Mean Center* tool, which identifies the geographic centre (or the centre of a concentration) of a feature).

+NZTM_NORTHING[1] (General Number, Double, 0 decimal places, Can not be NULL), short name = NZTM_NORTH:

The NZTM Northing coordinate of the centre of a site (based on the ArcGIS *Mean Center* tool, which identifies the geographic centre (or the centre of a concentration) of a feature).

+TENURE_ STATUS[1] (Text, Can not be NULL), short name = TENURE_STAT:

This provides an **indication (as of May 2011)** of the general status of the tenure of the land and/or water within a site boundary, as determined from the TENURE_DETAIL attribute (see below). The purpose of this attribute is to allow for simple categorisation and querying of sites by generalised tenure. Possible values are:

- 'Indeterminate' = according to the TENURE_DETAIL, the tenure status of a site could not be determined due to conflicting data, inadequate data or no data available;
- 'Private' = according to the TENURE_DETAIL, the tenure status of a site is entirely 'Private';
- 'Public' = according to the TENURE_DETAIL, the tenure status of a site is entirely 'Public'.
- 'Mixed' = according to the TENURE_DETAIL, the tenure status of a site is a combination of 'Private', 'Public' and/or 'Indeterminate'. Examples include where more than one property of different tenure status overlap the same location, where there is differing tenure status between the owner and the occupier of a property (i.e. see the last bullet point for the TENURE_DETAIL description), or where areas of "Paper Roads" and/or "Queens Chain" land run through or adjacent to land/water under different tenure within a site boundary; Where >95% land comprises one tenure status type, the land is attributed with that type even though the site is of mixed tenure.

+TENURE_DETAIL[1] (Text, Can not be NULL), short name = TENURE_DET:
This provides an **indication (as of May 2011)** of the type(s) of tenure of the land and/or water within a site boundary. For each site, this is a list of one or more of the tenure types below, with an estimate of the area of each tenure type in hectares (rounded to the nearest 0.001 ha in NZTM projection - anything smaller than 0.001 ha is not listed; see end of this attribute description for examples).

The possible tenure types identified are:

Crown(RC) – Regional Council = WRC land

Crown(TA) –Land vested in Territorial Authority

Crown(SOE) – any land under control of organisations on the Treasure SEO list – create document of list on DM and link to website

Crown(TLA and DOC) – mixed vesting

Crown(Other) - currently includes road (highway), rail corridors and hydrological components of the CRS

Indeterminate - either no clear information, or CRS extraction criteria not yet identified

Duplicate in Otorohanga metadata

- 'DOC' = land/water owned and/or administered by the Department of Conservation;
- 'Crown' = land/water owned and/or administered by any Crown agency other than a CRI, DOC or SOE;
- 'Crown(DC) ' = land/water owned and/or administered by a Territorial Authority. Land owned or administered by Territorial Authorities may be indicated using an appropriate acronym or short name for that district council, e.g. 'WaipaDC' for the Waipa District Council;
- 'Crown(WRC) = land/water owned and/or administered by the Waikato Regional Council;
- 'Private' = land/water under private ownership and/or administration (includes Maori owned/administered areas);
- 'Indeterminate' = land/water ownership and/or administration that could not be determined due to conflicting data, inadequate data or no data available for the particular area.
- 'Indeterminate(Leased)' = land/water ownership and/or administration under lease. Usually the occupier is different from the owner but not in all cases.

Where an SNA site comprises multiple tenure types, the tenure components are listed in order of greatest to smallest in area, separated by a comma. For example: 'DOC 1.885, Crown 0.309', 'Private 4.074; Crown 0.295; Indeterminate 0.23', etc.

+PROTECTION_STATUS[1] (Text, Can not be NULL), short name = PROT_STAT:
This provides an **indication (as of May 2011)** of the **primary general legal protection status** of the site, in terms of **protection of biodiversity values**, as determined from the PROTECTION_DETAIL attribute (see below). The purpose of this attribute is to allow for simple categorisation and querying of sites by generalised protection status.

The possible values for this attribute are:
- 'Indeterminate' = the predominate protection status of the biodiversity values of a site could not be determined due to conflicting data, inadequate data or no data available. This includes areas of "Paper Roads" and "Queens Chain" land/water;
- 'Protected' = the biodiversity values of the site are primarily legally protected (this may include multiple types of legal protection; see the PROTECTION_DETAIL attribute for more information).
- 'Unprotected' = the biodiversity values of the site are primarily not legally protected (**NB:** this status will also apply for legal protection types that do not apply to the protection of biodiversity values, e.g. 'Quarry Reserve' and similar types of local purpose utility reserves).

+PROTECTION_DETAIL[1] (Text, Can not be NULL), short name = PROT_DET:

This provides an **indication (as of May 2011)** of whether the land and/or water within a site boundary is legally protected as a reserve, covenant and/or other type of legally protected area

(i.e. under the Conservation Act 1987, Reserves Act 1977, etc), or if no type of legal protection applies, or if the type of legal protection could not be determined. For each site, this attribute contains a list of one or more protection types (some are listed below), with an estimate of the area of each protection type in hectares (rounded to the nearest 0.001 ha in NZTM projection - anything smaller than 0.001 ha is not listed; see end of this attribute description for examples). All types of legal protection are included, regardless of whether the protection type applies to biodiversity values.

There are many possible values for this attribute, some examples include:

- Some common legal protection types identified are: 'Cemetery Reserve', 'Conservation Park', 'Government Purpose Reserve (may include detailed type in brackets, e.g. Wildlife Management)', 'Historic Reserve', 'Local Purpose Reserve (may include detailed type in brackets, e.g. Esplanade)', 'Marginal Strip', 'Marine Reserve', 'Nature Reserve', 'Nga Whenua Rahui Kawenata Covenant', 'QEII Open Space Covenant', 'Quarry Reserve', 'Recreation Reserve', 'Scenic Reserve', and 'Stewardship Area'. For definitions of the different reserve, covenant or other protection types, consult the source data or documentation of the relevant Act;
- 'Indeterminate' is used where the legal protection type could not be determined due to conflicting data, inadequate data or no data available for the particular area.
- 'Unprotected' is used where the data available indicates that no legal protection currently applies to the particular area.

Where more than one protection type overlaps a site boundary, the protection types are listed in order of greatest to smallest in area of overlap, separated by a semi-colon. For example: 'Unprotected 3.282; Indeterminate 2.914', ' Conservation Park 1598.481; Indeterminate 29.941; Stewardship Area 14.687; Unprotected 0.013', etc.

+ECOLOGICAL_DISTRICT[1] (Text, Can be NULL), short name = ECO_DIST:
This lists the name(s) of the Ecological District(s) that a site overlaps. If more than one Ecological District overlaps a site, the names of the Ecological Districts are listed in order from greatest to smallest in area of overlap, separated by a semi-colon (e.g. 'Hamilton; Waipa').

+BIOCLIMATIC_ZONE[1] (Text, Can be NULL), short name = BIOCLIM_ZONE:
This lists the Bioclimatic Zone(s) (as defined by Leathwick et al. (1995)) that a site overlaps. If a site overlaps more than one Bioclimatic Zone, the names of the Bioclimatic Zones are listed in order from greatest to smallest in area of overlap, separated by a semi-colon (e.g. 'Lowland; Submontane').

+VEGETATION_1840[1] (Text, Can be NULL), short name = VEG_1840:
A list (from the spatial data set) of all vegetation units as described in Appendix II of Leathwick et al. (1995), and the Regional Indigenous Vegetation Inventory (RIVI) 1840 layer, that overlap a site, in order from greatest to smallest in area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any VEGETATION_1840 spatial data, or the field will be empty (i.e. Null).

+VEGETATION_1992[1] (Text, Can be NULL), short name = VEG_1992:
A list (from the spatial data set) of all vegetation units as described in Appendix II of Leathwick et al. (1995), and the Regional Indigenous Vegetation Inventory (RIVI) 1840 layer, that overlap a site, in order from greatest to smallest in area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any VEGETATION_1992 spatial data, or the field will be empty (i.e. Null).

+BIOVEG_2002[1] (Text, Can be NULL), short name = BIOVEG_02:
A list of all Land Cover Database 2 (LCDB2) classes from the Biodiversity Vegetation (BIOVEG) 2002 spatial data set that overlap a site, in order from largest to smallest in area, separated by a

semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any BIOVEG_2002 spatial data, or the field will be empty (i.e. Null).

+BIOVEG_2007[1] (Text, Can be NULL), short name = BIOVEG_07:
A list of all Land Cover Database 2 (LCDB2) classes from the Biodiversity Vegetation (BIOVEG) 2007 spatial data set that overlap a site, in order from largest to smallest area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any BIOVEG_2007 spatial data, or the field will be empty (i.e. Null).

SIGNIFICANT_FLORA[2, 3] (Memo, Can be NULL), short name = SIGNIF_FLORA:
A list of flora species known to occur within a site, that are classified, according to the New Zealand threat classification system manual (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient' (based on de Lange et al. 2009 for vascular flora). Indigenous non-vascular flora not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species or associations of flora known to occur at a site, in particular regionally threatened or regionally uncommon species. Species names generally consist of the Latin name followed by the common name in brackets (if known) and threat status in brackets, followed by a reference for the species record (if available), e.g. *Ptisana*

LIKELY_ FLORA[2, 3] (Memo, Can be NULL):
A list of flora species likely to occur within a site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient' (based on de Lange et al. 2009 for vascular flora). Indigenous non-vascular flora not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species or associations of flora likely to occur at a site, in particular regionally threatened or regionally uncommon species. See SIGNIFICANT_FLORA for examples.

SIGNIFICANT_FAUNA[2, 3] (Memo, Can be NULL), short name = SIGNIF_FAUNA:
A list of fauna species known to occur within a site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient'. Indigenous fauna not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species or associations of fauna known to occur at a site, in particular regionally threatened or regionally uncommon species. Species names generally consist of the Latin name followed by the common name in brackets (if known) followed by the threat status, in brackets, followed by a reference for the species record (if available), e.g. *Chalinolobus tuberculatus* (North Island long-tailed bat) - (Nationally Vulnerable) (DOC 2010), *Anthornis melanura melanura* (bellbird) - (Regionally Uncommon tbc) (DOC 2010), etc.

LIKELY_ FAUNA[2, 3] (Memo, Can be NULL):
A list of fauna species likely to occur within a site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient'. Indigenous fauna not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species or associations of fauna likely to occur at a site, in particular regionally threatened or regionally uncommon species. See SIGNIFICANT_FAUNA for examples.

OTHER_FEATURES[2, 3] (Memo, Can be NULL), short name = OTHER_FEAT:
This is a list and description of any other distinctive features known about a site, with a reference included where available. This could include:

- if a site occurs on or overlaps a Site of Special Wildlife Interest (SSWI), a Wetland of Ecological and Representative Importance (WERI), or other designated site of ecological importance;
- if a site contains, overlaps, or lies near an archaeological site, a historic site, a Pa site, etc.;
- or if a site contains any distinct, special, or important geographical, geological or other type(s) of feature(s).

CRITERION_1[2] (Text, Can not be NULL):
The assessment of criterion 1 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat for indigenous fauna that has been specially set aside by statute or covenant for protection and preservation, unless the site can be shown to meet none of Criteria 3-11."
Possible values: 'Indeterminate', 'No' or 'Yes'.

CRITERION_2[2] (Text, Can not be NULL):
The assessment of criterion 2 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund, or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11."
Possible values: 'Indeterminate', 'No', or 'Yes'.

CRITERION_3[2] (Text, Can not be NULL):
The assessment of criterion 3 of the significance criteria in Appendix 3 of the Operative RPS: "It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- threatened with extinction; or
- are endemic to the Waikato Region."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_4[2] (Text, Can not be NULL):
The assessment of criterion 4 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or a habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally." Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_5[2] (Text, Can not be NULL):
The assessment of criterion 5 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, Chenier plain, or karst ecosystems."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_6[2] (Text, Can not be NULL):
The assessment of criterion 6 of the significance criteria in Appendix 3 of the Operative RPS: "It is wetland habitat for indigenous plant communities and/or indigenous fauna communities that has not been created and subsequently maintained for or in connection with:

- waste treatment; or
- wastewater renovation; or
- hydro electric power lakes; or
- water storage for irrigation; or
- water supply storage;

unless in those instances they meet the criteria in Whaley et al. (1995)."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_7[2] (Text, Can not be NULL):
The assessment of criterion 7 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_8[2] (Text, Can not be NULL):
The assessment of criterion 8 of the significance criteria in Appendix 3 of the Operative RPS: "It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region, and which contains healthy, representative populations of that species."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_9[2] (Text, Can not be NULL):
The assessment of criterion 9 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because:

- its structure, composition, and ecological processes are largely intact; and
- if protected from the adverse effects of plant and animal pests and of adjacent land use (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_10[2] (Text, Can not be NULL):
The assessment of criterion 10 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat that forms part of an ecological sequence that is either not common in the Waikato Region or an ecological district, or is an exceptional representative example of its type."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_11[2] (Text, Can not be NULL):
The assessment of criterion 11 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor; and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects."
Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+CRITERIA_YES[1] (Text, Can be NULL), short name = CRIT_YES:
This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) that are known to be met at a site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Yes'.

+CRITERIA_LIKELY[1] (Text, Can be NULL), short name = CRIT_LIKELY:
This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) that are likely to be met at the site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Likely'.

+CRITERIA_INDETERMINATE[1] (Text, Can be NULL), short name = CRIT_INDET:
This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) for which it could not yet be determined if they are known or likely to be met at a site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Indeterminate'.

+SIGNIFICANCE[2] (Text, Can not be NULL):
This indicates the significance of a site as determined from the assessment of the 11 RPS significance criteria. This consists of one of the following for each site:

- The level of significance of a site that is considered to meet one or more of the 11 RPS significance criteria. Possible levels for significant sites are: 'Local', 'Regional', 'National', or 'International'. These significance levels are applied using the guidelines outlined in Waikato Regional Council Technical Report TR2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to apply Regional Criteria and Determine Level of Significance";
- Or identifies the significance of a site as 'Likely' where one or more of the 11 RPS significance criteria are assessed as 'Likely' and no criteria are assessed as 'Yes';
- Or identifies the significance of a site as 'Indeterminate' where one or more of the 11 RPS significance criteria are assessed as 'Indeterminate' and no criteria are assessed as 'Yes' or 'Likely';
- Or identifies a site as 'Not Significant' where all 11 RPS criteria are assessed as 'No'.

SIGNIFICANCE_JUSTIFICATION[2] (Memo, Can be NULL), short name = SIGNIF_JUST:
A brief explanation and/or justification for the level of significance given to a site, including justification for any of the 11 RPS significance criteria known to be met; or an explanation/justification for why a site was identified as 'Likely' to be significant or not significant.

NB: This attribute may be empty for sites identified as 'Not Significant'.

+CONFIDENCE_LEVEL[2] (Text, Can not be NULL), short name = CONF_LEVEL:
This is an assessment of the level of confidence in the information available for a site and the assessment of the significance of a site. This also indicates the need for a field survey prior to any decisions being made about a site, such as consent processing, plan schedule development, or funding allocations. Possible values are: 'Low', 'Medium', or 'High'. Sites with 'Low' confidence are considered to have the highest need for field survey. The definitions and factors that are considered when applying a confidence level are provided in Wildland Consultants Ltd. Contract Report No. 1080 (DOC# 1396563). It is important to note that a site of low confidence should be considered no less significant than other sites of higher confidence, but of the same significance, unless other information proves otherwise. Users should also consider that sites identified as being of no, indeterminate or likely significance, but of low confidence, may potentially be of higher significance but there was insufficient information to determine this at the time of the desktop inventory.

+PEST_ANIMAL_ISSUE[2] (Text, Can not be NULL), short name = ANIMAL_ISSUE:
This is used to indicate whether any pest animal (as defined in WRC Regional Pest Management Strategy) management issues are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+PEST_PLANT_ISSUE[2] (Text, Can not be NULL), short name = PLANT_ISSUE:
This is used to indicate whether any pest plant (as defined in WRC Regional Pest Management Strategy) and other weed management issues are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+STOCK_ISSUE[2] (Text, Can not be NULL):
This is used to indicate whether any stock management issues are known or likely to exist at a site, such as a lack of stock proof fencing or the presence of stock. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+DEVELOPMENT_ISSUE[2] (Text, Can not be NULL), short name = DEVEL_ISSUE:

This is used to indicate whether any development management issues are known or likely to exist at a site, such as proposed or operational subdivision, wind farms, clearance, land use change or power pylons. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+OTHER_ISSUE[2] (Text, Can not be NULL):
This is used to indicate whether any other management issues not covered by the above categories are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

ISSUE_JUSTIFICATION[2] (Memo, Can be NULL), short name = ISSUE_JUST:
This provides a brief explanation or justification for the result of the assessment of management issues at a site, particularly for management issues that are known or likely to exist at a site. **NB:** This attribute may be empty if the site has no issues.

+REFERENCES[2] (Text, Can not be NULL):
This is a list of citations, delimited by semi-colon, that refer to the primary sources of information used in the assessment of a site. This may include spatial data sets, databases, various types of reports and surveys, and personal observations. A bibliography of the information sources cited in this attribute is provided in either a separate document or MS Excel worksheet.

+BOUNDARY_SOURCE[2] (Text, Can not be NULL), short name = BOUND_SOURCE:
This is a list of citations, delimited by semi-colon, for the spatial data sets used to derive the boundary of a site (e.g. WRAPS (2007); BIOVEG (2007); DoC (2006), etc.). A bibliography of the data sets cited in this attribute is provided in either a separate document or MS Excel worksheet.

ASSESSMENT_NOTES[2] (Memo, Can be NULL), short name = NOTES:
This contains any additional relevant notes or information about a site that could not be recorded appropriately in any of the other attributes described above.

GIS Features:
GIS_ALL.SNA_WP_DP_PROP

Key Words:

Biodiversity, Significant, Ecology, Ecosystem, Ecological, Valuable, Native, Natural, Indigenous, Inventory, Rare, Sites, Areas, SNA, Terrestrial, Vegetation, Wetland, Threatened, Endangered, Flora, Fauna, Thames, Coromandel, Protected, Criteria, RPS, Sand Dune, Offshore Island

Resource:

Land, GIS

Data Set Ids:

1291.02@EW.GOVT.NZ
DOCS# 2011952

Metadata Date:

15 July 2011

Contact Details

Contact Organisation:

Waikato Regional Council (WRC)

Contact Position:

GIS Officer – Biodiversity

Programme:

Spatial Information

Contact Address:

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Email: inforeq@ew.govt.nz

Supplier:

Kessels & Associates Ltd
575 Grove Road, RD5
Te Pahu, Hamilton

Spatial Information

Geographic Extent:

Various locations throughout the Waipa District of the Waikato Region, New Zealand.
Positional Accuracy:
The boundaries of the SNA_Waipa_2007_Provisonal data set are derived from other data sets, which are listed in the "Related Information" section of this metadata. The positional accuracy of SNA_Waipa_2007_Provisional is thus dependent on the positional accuracy of these other data sets. The accumulated positional accuracy of SNA_Waipa_2007_Provisional could potentially be as much as +/-30 metres, although it will usually be much less than this.

Other:

The data have been captured at scale(s) of 1:10,000 or smaller and it is advised not to use the data at scales greater than this (such as 1:5,000). The specified minimum mapping unit was 0.5 hectares. However, where the contractor believed that a site smaller than 0.5 hectares is an outstanding or exceptional site when assessed against the criteria provided, then EW agreed on the inclusion of these.

Data Acquisition History

Period and Frequency of Record:

The derivation of SNA_Waipa_2007_Provisional relied heavily on a "desktop" exercise using the 2007 WRAPS Aerial Photography (i.e. most sites were not inspected in the field). Therefore, it must be regarded as a “point in time” data set representing the state of indigenous terrestrial vegetation and wetland ecosystems as at 2007.
Further information used for the inventory and assessment of SNA was obtained from other existing GIS data, literature and/or reports.
It is expected the data set will be reviewed or updated at regular intervals depending on the availability of new aerial or satellite imagery. However, due to the large amount of work involved with such an inventory, this may only be in 5-10 year intervals.

Data Acquisition Method(s):

Summary:

This significant natural areas (SNA) data set was derived primarily from a "desktop" analysis of the WRAPS 2007 aerial photography and Biodiversity Vegetation (BIOVEG) (2007) spatial data, along with other relevant spatial data, literature and information, where available. Most areas were not inspected in the field. The significance of each site was evaluated using the 11 Waikato Regional Policy Statement (RPS) significance criteria (Appendix 3 of the RPS). Up to five types of management issues were also assessed at each site. Data related to the "Ecosystem-based Ranking" of sites with a significance of 'International', 'National' or 'Regional' may be appended at a later stage.

Detail:

1. EW provided contract specifications (DOCS# 1646740) and the following relevant existing data sets to Kessels & Associates Ltd (hereafter "Kessels"):

Waikato Regional Council Data supplied by Waikato Regional Council

- Extract of "GIS_PHOTOS.WRAPS07_5K" from the Aerial Photography - WRAPS 2007 - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1410510/ - **WRC Metadata Document Number 1410510**) for the Waipa District area.

- Extract of "GIS_ALL.AUTHORISATIONS", "GIS_ALL.AUTH_SURFACE_WATER_TAKE", and "GIS_ALL.AUTH_APPLICATIONS_RECENT" from the Authorisations (RUAMS) - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/742462/ - **WRC Metadata Document Number 742462**) for the Waipa District Area.

- Bioclimatic Zones - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1086812/ - **WRC Metadata Document Number 1086812**).

- Extract of Biodiversity Vegetation (BIOVEG) - GIS Layer (2002) (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1172690/ - **WRC Metadata Document Number 1172690**) for the Waipa District area (also Otorohanga and South Waikato Districts if needed).

- Extract of Biodiversity Vegetation (BIOVEG) - GIS Layer (2007) (**WRC Metadata Document Number 1652753**) for the Waipa District area (also Otorohanga District area if needed).

- Extract of Biosecurity - Regional Animal Pest Control Areas - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/884786/ - **WRC Metadata Document Number 884786**) for the Waipa District Area.

- Draft "Maungatautari Ecological Island Fence" GIS Layer. **Acknowledgement, Reference, and/or Copyright Notice**: "Maungatautari Ecological Island Fence derived by Waikato Regional Council, 2006. Copyright Reserved."

- Copy of the report: “Natural Heritage of Waipa District” (Wildland Consultants Ltd contract report no. 1530), **WRC Document Number 1197506**.

- Copy of the report “Natural Heritage of Waipa District - Datasets and Publications" (Wildland Consultants contract report no. 1535), **WRC Document Number 1197512**.

- Extract of "GIS_ALL.RACS_CLNSTRM_APPLICANT", "GIS_ALL.RACS_CLNSTRM_COMPARTMENT" and "GIS_ALL.RACS_CLNSTRM_FENCE" from the RACS Clean Streams Assets GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1065967/ - **WRC Metadata Document Number 1065967**) for the Waipa District Area.

- Extract of "GIS_ALL.RACS_SOILCON_COMPARTMENT" and "GIS_ALL.RACS_SOILCON_FENCE" from the RACS Soil Conservation Assets GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1216544/ - **WRC Metadata Document Number 1216544**) for the Waipa District Area.
- Rivers SNA - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1470535/ - WRC Metadata Document Number 1470535) and associated Technical Report: "Identification of High Value Rivers and Streams in the Waikato Region: Final Report" - **WRC Document Number 1460478**.
- Copy of the DRAFT final report: Scoring and Ranking of Lake Ecosystems in the Waikato Region for Biodiversity Management (Wildland Consultants contract report no. 2091a), **WRC Document Number 1573861**.
- Significant Natural Areas (SNA) data and reports (if available) for the Hauraki (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1466611/ - **WRC Metadata Document Number 1466611**), South Waikato, Thames-Coromandel and Waitomo http://www.waikatoregion.govt.nz/Environmental-information/REDI/1325570 - **WRC Metadata Document Number 1325570**) Districts.
- Extract of the Draft "Significant Natural Areas - Karst Ecosystems" GIS Layer for the Waipa District Area. **Acknowledgement, Reference, and/or Copyright Notice**: "Derived from Waikato Regional Council Significant Natural Areas - Karst data, 2010. Copyright Reserved."
- Draft "Waikato Region Limestone Geology Likelihood" GIS Layer. **Acknowledgement, Reference, and/or Copyright Notice**: "Waikato Region Limestone Geology Likelihood features derived by Waikato Regional Council, 2009. Copyright Reserved."
- Bioclimatic Zones - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1086812/ - **WRC Metadata Document Number 1086812**).
- Extract of Biosecurity - Regional Animal Pest Control Areas - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/884786/ - **WRC Metadata Document Number 884786**) for the Waipa District Area.

Data supplied by the New Zealand Archaeological Association (NZAA)

- Extract of Archaeological Sites GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/881908/ - **WRC Metadata Document Number 881908**) for the Waipa District Area.

Data supplied by the Department of Conservation - *Te Papa Atawhai*

- Extract of DoC Waikato Conservancy - Biodiversity Information Management System (BIMS) spatial data and reports available for the Waipa District Area.
  Conditions of Use, Acknowledgements, Copyright Statements, Disclaimers: None known, but acknowledgement should be given as "DoC (year)" (see BIM report for correct year) if information in BIMS reports is used to derive outputs of the Project.
- Extract of DOC - Wetlands of Ecological and Representative Importance (WERI) - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1021377/ - **WRC Metadata Document Number 1021377**) for the Waipa District Area.
- Extract of Ecological Regions and Districts - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/881153/ - **WRC Metadata Document Number 1021377**) for the Waipa District Area.
- Extract of Department of Conservation - Public Conservation Land GIS Data (available for free from koordinates.com - please download metadata, copyright notice(s) and related documentation from the website).

Data derived from Land Information New Zealand LandOnline Data and Territorial Authority District Valuation Roll

- "GIS_ALL.CRS_PROPERTY_WAIPA" from the Properties - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/888036/ - **WRC Metadata Document Number 888036**).

Data supplied by Land Information New Zealand (LINZ)

- Extract of "GIS_ALL.NZTM_MAP_GRID" from the Topographic Map Grids GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/915250/ - **WRC Metadata Document Number 915250**) for the Waipa District area (also freely available from LINZ).
- Extract of "NZTopo Lakes", "NZTopo Ponds" and "NZTopo Rivers" from 2009 LINZ NZTopo data, for the Waipa District area. Relevant metadata - **WRC Metadata Document Number 885309** (http://www.waikatoregion.govt.nz/Environmental-information/REDI/885309/).
- Extract of "GIS_ALL.GEOGRAPHIC_PLACE_NAME_EW" from the Geographic Place Names - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/881334/ - **WRC Metadata Document Number 881334**) for the Waipa District area.

Data supplied by Landcare Research - *Manaaki Whenua* and co-owned by Waikato Regional Council)

- Extract of Regional Indigenous Vegetation Inventory (RIVI) (WRC Metadata Document Number 881138) spatial data that overlap the Waipa District.

Data supplied by QEII National Trust

- Extract of QEII National Trust Covenants - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/881117/ - **WRC Metadata Document Number 881117**) for the Waipa District area (note: WRC does not have biodiversity information for QEII covenants, contact QEII National Trust for this information).

Data supplied by Statistics New Zealand

- Extract of "GIS_ALL.POL_2009_TERR_AUTHORITY_EW_L1" from the Political Boundaries - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/883529/ - **WRC Metadata Document Number 883529**) for the Waipa District area (also freely available from LINZ).

Data supplied by Terralink International Ltd

- Extract of "GIS_PHOTOS.WRAPS02" from the Aerial Photography - WRAPS 2002 - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/881411/- **WRC Metadata Document Number 881411**) for the Waipa District area.

Data supplied by Terralink International Ltd based on Land Information New Zealand LandOnline Data

- Extract of "GIS_ALL.CRS_PARCEL" from the CRS - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/871640/ - **WRC Metadata Document Number 871640**) for the Waipa District.

Data supplied by the Waikato Biodiversity Forum

- Extract of Biodiversity Community Restoration Projects - GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/992959/ - **WRC Metadata Document Number 992959**) for the Waipa District area.

Data supplied by the Waipa District Council

- Extract of "GIS_ALL.DIST_PLAN_WPDC_RES" from the District Planning Zones GIS Layer (http://www.waikatoregion.govt.nz/Environmental-information/REDI/1062713/ - **WRC Metadata Document Number 1062713**) for the Waipa District area.

Other data sets freely supplied under no license

- Subset of NZTOPO50 Topographic Maps (DOCS# 1562505) for Waipa District
- Subset of LANDCOVER_DATABASE2 (DOCS# 933628) for Waipa District
- Subset of Land Environments New Zealand (LENZ) (DOCS# 881554) for Waipa District
- Subset of DOC_NGA_WHENUA_RAHUI_COVENANT (DOCS# 1215463) for Waipa District
- Subset of ECOLOGICAL_DISTRICT (DOCS# 881153) for Waipa District
- Subset of BIOCLIMATIC_ZONE (DOCS# 1086812) for Waipa District
- Subset of "Vegetation Monitoring Plots" GIS data layer for the Waipa District (non-corporate, under development)
- Waipa District Ecological Sites GIS data, photos and documents sourced from Waipa District Council
- Subset of.KEY_ECOLOGICAL_SITES (DOCS# 881987) for Waipa District
- Subset of DoC BIMS GIS data and accompanying reports for Waipa District
- Scanned copies of 1993 WRAPS for the Waipa District if required
- Subset of BIOSEC_TB_VECTOR_SECTOR (DOCS# 882824) for Waipa District
- Subset of DOC.PERMISSIONS GIS data set for the Waipa District
- Sites of Special Wildlife Interest (SSWI) for Waipa District
- Simplified version of CRS_PROPERTY_WAIPA (DOCS# 888036) with the following attributes only:
  LEGAL_DESC1
  AREA_SQM
  CAP_VALUE
  LAND_VALUE
  IMPROVEMENTS
  LAND_USE_COD
  ZONE_CODE
  VNZ_CAT_CODE

2. Details of the methodology used by Kessels and Associates for identifying, evaluating and creating the SNA_Waipa_2007_Provisional attribute and spatial data are provided in the following documents: Contract for Services: Inventory and ranking of significant natural areas of Waipa District (DOCS# 1646740), and Waikato Regional Council Technical Report 2011/##: "Significant Natural Areas of the Waipa District: Terrestrial and Wetland Ecosystems" (DOCS# 1797004 – Still to be published). The main steps in the methodology are broadly summarised below:

1) Carried out literature review and compilation of relevant reports, field surveys and other data sets for Waipa District.

2) Reviewed boundaries and classification (i.e. LCDB2_NAMEattribute) of BIODIVERSITY VEGETATION_2007 (hereafter "bioveg") GIS data for Waipa District. Revised boundaries of bioveg polygons where boundaries were deemed inaccurate based on interpretation of 2007 WRAPS imagery, Google Earth imagery or LCDB2 data. Where existing

classification was deemed inaccurate, Kessels revised this based on interpretation of 2007 WRAPS imagery, Google Earth imagery, LCDB2, or other data or reports where possible.

3) BIOVEG polygons classified as exotic vegetation were removed, except for those with the "Deciduous Hardwoods" LCDB2_NAME that were also identified as wetlands. The resulting data set was named "INDIGENOUS_VEGETATION".

4) Council GIS staff intersected INDIGENOUS_VEGETATION with spatial data of protected land areas (i.e. DoC, QEII, NWR, and WAIPA Reserves and Covenants) to split the geometry into that which is on protected land and that which is not. The resulting data was kept as one data set with the addition of a "PROTECTION_STATUS" and “PROTECTION_DETAIL” attributes to record this.

5) Council GIS staff aggregated tenure information from CRS_PROPERTY data into the "INDIGENOUS_VEGETATION" data set. The resulting data was kept as one data set with the addition of a "TENURE_STATUS" and “TENURE_DETAIL” attributes.

6) GIS processing was carried out on INDIGENOUS_VEGETATION to remove slivers and undersized polygons (usually under 0.5ha) that resulted from the above split and also to merge “paper roads” and “queens chain” land into the most obvious contiguous sites. This processing was carried out by council GIS staff.

7) The geometry of INDIGENOUS_VEGETATION was used as the base layer from which to derive the SNA_Waipa_2007_Provisional data set (hereafter "SNA") using the guidelines in EW technical report TR2002/15 by Wildland Contractors Ltd and EW, 2002: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region. Guidelines to apply Regional Criteria and Determine Level of Significance". The SNA data required some boundary revisions, splitting and merging of polygon geometries depending on the circumstances. Only the SITE_NO attribute was directly recorded into the spatial data. All other attributes were recorded for each site in an MS Excel spreadsheet, using picklists where relevant, to be joined to the spatial data at a later stage.

8) Kessels and Associates Ltd incorporated a revised methodology of assessing the significance of SNA based on RPS Criterion 3, developed by Wildland Consultants Ltd in consultation with EW and Kessels & Associates, and based on newly released threat classification systems (Townsend et al., 2008) for vascular flora (de Lange et al., 2009) and avifauna (Miskelly et al., 2008). Details of this revised methodology are provided in DOCS# 1496182.

9) A ranking assessment was also applied to internationally, nationally and regionally significant sites based in the specifications in the following document: Contract for Services: Inventory and ranking of significant natural areas of Waipa District (DOCS# 1646740). This task was jointly carried out by Kessels and Associates Ltd and Waikato Regional Council.

10) Draft SNA data and report were provided to the Council for review. The Council proceeded to validate, quality assure and check logical consistency of the geometry and attributes of the data, and the associated report, and provided feedback with recommended changes to Kessels and Associates Ltd. This step and step 11 were repeated a number of times until the outputs were deemed satisfactory by the Council.

11) Kessels and Associates Ltd revised and updated Bioveg and SNA data sets as deemed necessary in negotiations with the Council.

12) The data and report were also provided to Waipa District Council and DOC - Waikato Conservancy for review at a later stage. The feedback from these organisations was also provided to Kessels and Associates Ltd to integrate recommendations where possible.

13) Metadata was written by the Council and the data was made corporate as GIS_ALL.SNA_WAIPA_2007_PROVISIONAL.

14) The final report is yet to be made a full Council Technical Report for publishing pending some minor revisions and permission being granted from Waipa District Council and DOC.

15) The provisional data is still subject to feedback from DoC and Waipa District Council. It is likely to change pending their recommendations.

Data Quality Information

Data Quality:
In terms of geometry, the data set is only as accurate as the data sets it was derived from (see section 3 above for a list of these and more information on positional accuracy). The data set repeatedly had its geometry and connectivity validated and fixed at 1m tolerance throughout the process of development. While the geometry is considered sound, some connectivity errors (such as vertices within 1m of each other) may still exist as a result of the intersection of different data sets used to create this SNA data set, and also due to these errors being inherent in some of the source data sets.

Attribute Accuracy:

Many of the attributes will also be only as accurate as the data sets they were derived from. Whether land is protected or not is dependent on the accuracy of QEII, DoC and Waipa District Council Reserve and Covenant data sets; whether vegetation is indigenous or exotic, is primarily based on the accuracy of the classification used in the Bioveg data set which tends to be around 80% accurate. However, many attributes were recorded based on expert ecological knowledge of the area by Kessels & Associates, with additional information from existing literature and reports.

The 11 criteria that the significance of sites was assessed against are found in appendix three of the Council Regional Policy Statement. Kessels and Associates Ltd were provided with these criteria and they understood how to objectively assess them in a desktop exercise based on Waikato Regional Council Technical Report TR2002/15: "*Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to apply Regional Criteria and Determine Level of Significance" (DOCS# 791472).*

Some field validation was carried out in order for Kessels to gain familiarity with the Waipa district but this was limited in the context of this project. It is important to consider that this limited field validation was done in 2010 which is three years after the aerial photography used for the analysis of sites was captured (i.e. WRAPS 2007). Therefore, any field validation had to consider what might have existed at the site one to two years ago.

The “CONFIDENCE_LEVEL” attribute was used by Kessels and Associates Ltd to indicate their confidence in the accuracy of the significance they have allocated to a site. This is dependent upon the availability, accuracy, currency and completeness of ecological information for a site, and Kessels and Associates Ltd confidence in the information.

While the data has been repeatedly and thoroughly checked for errors, including spelling and grammar, it is likely that some minor errors will still be present.

Completeness:

As at 22 July 2011, the provisional data is considered 95% complete, subject to the limitations of a desktop study with limited field validation. There may be modifications to this original data set or a revised version of the data set should more information become available or should feedback, including that from Waipa District Council, DoC and/or other sources, including private landowners and field observations necessitates it. A number of attributes are yet to be populated and the provisional data could change significantly in some places, especially as a result of the Waipa District Plan review which is under way 2010-2012.

Some attributes will be empty for some sites as 'Null' is a valid value for some fields.

Users of the data can question the accuracy of it and recommend changes to the data set owner but the data set owner will decide whether or not to implement those changes at their own discretion.

It is impossible to achieve 100% accuracy with the creation of data sets such as this as individual land use and ecosystem units are likely to change faster than such data sets can be mapped region-wide, and some areas are impossible to check in the field unless the data set creator had unrestricted access to all areas, including inaccessible areas, along with a limitless budget and ample time. The completeness of this SNA_Waipa_2007_Provisional data set is also subject to the limitations of the data sets it was derived from.

The data is considered a provisional inventory, ranking and scoring of SNA within Waipa District as at 2007. It is to be used in subsequent analyses and community consultation to help with validating and finalising the SNA of the Waipa District.

Logical Consistency:

The data have been captured at scale(s) of 1:10,000 or smaller. It is strongly advised the data not be used at scales greater than this (such as 1:5,000) without detailed field survey.

This data set has been derived from several other data sets and the logical consistency with these data sets is considered sound as the Council was extremely careful in the planning and implementation of quality checking procedures such as geometry and connectivity validation and fixing. Attributes were thoroughly checked for any spelling errors or inconsistencies.

Some of the data was validated and commented on by Waipa District Council and DoC staff that had good local knowledge of the ecology in the area.

Distribution Information

Data Form:

Digital GIS files (Oracle Spatial, MS Access (GeoMedia), Shapefiles, MapInfo files), MS Excel files, hard copy printed and digital (pdf, jpeg, tiff) GIS map outputs at a range of scales, technical report in PDF.

Digital Format:

The spatial data was captured and edited in ArcGIS and GeoMedia Professional, and was quality checked in GeoMedia Professional. A read-only copy of the master version of the spatial data with appended attributes (named "SNA_Waipa_2007_Provisional") is stored in an MS Access GeoMedia warehouse (S:\GISWork\RIG\BIODIVERSITY\Significant_Natural_Areas\Master_Data\SNA_TerrestrialAndWetland_Spatial_Master.mdb). This spatial data set with only SITE_NO and ID as attributes was then exported to Oracle Spatial DB (GIS_ALL.SNA_WAIPA_2007_PROVISIONAL) for use.

The complete attribute data is stored in an MS Excel workbook in EW's corporate document management system: DOCS# 1811876. A backup copy of the complete attribute data is also stored in a separate MS Access database, in a folder on the Council network drive: S:\GIS\RES_INFO\RIG GIS data\Significant_Natural_Areas\General\Backup. Most GIS software should be able to attach or import the Master_Data sheet in a copy of this workbook to a spatial database and then join suitable attributes (see section One above) to the spatial data.

A master version of the data will be maintained by Waikato Regional Council. Users of the data can question the accuracy of it and recommend changes to the Council but appropriate Council staff will decide whether or not to implement those changes at their own discretion. Any changes required of the data set must only be carried out on this master data set by

Council staff. Waikato Regional Council holds no responsibility for any copies or derivatives of the data set that are edited by other parties.

Applications:

The data set was primarily created for Waikato Regional Council's "Prioritising Natural Areas for Biodiversity Management" project (DOCS# 1122331, 1123720, and 1204845). However other Council groups, such as River and Catchment services and Biosecurity, can also use the data to assist in their operations. Waipa District Council will be using the data for its own planning, prioritisation and consultation purposes.

The data is considered a provisional inventory and ranking of SNA of the Waipa District as at 2007. It is to be used in subsequent analyses and community consultation to help with the validation and finalisation of a list of SNA of the Waipa District.

PLEASE NOTE THE DISCLAIMERS BELOW.

The first report to be derived directly from the data set is the Kessels and Associates Ltd et al. contract report, "Significant Natural Areas of the Waipa District: Terrestrial and Wetland Ecosystems". This has been reviewed by Council, DoC and Waipa Territorial authority staff but is yet to be made a technical report and published.

Data Set Availability:

The data was initially available only to Waikato Regional Council and Kessels and Associates Ltd staff to be used strictly for internal purposes. The spatial data, the "Significant Natural Areas of the Waipa District" report, and a spreadsheet of all attribute and ranking data can be made available to Waipa District Council for internal planning purposes upon the completion of a license agreement. This license can expire, be cancelled or be superseded depending on when circumstances require it.

The provisional data can be made available to other parties pending permission being granted from both Waipa District Council planning staff and Waikato Regional Council Natural Areas / Biodiversity Prioritisation Project staff. A restrictive license agreement between any user and Waikato Regional Council will be required to be signed until the notification date of the Proposed Waipa District Plan. At that time the provisional data will be made freely available under a Creative Commons license.

Access to the data in the SIGNIFICANT_FLORA, LIKELY_FLORA, SIGNIFICANT_FAUNA, LIKELY_FAUNA and OTHER_FEATURES attributes is restricted to Kessels and Associates Ltd and Waikato Regional Council staff and their contractors only. Requests for this data must be submitted to appropriate Council Significant Natural Areas / Biodiversity Prioritisation Project staff for consideration and approval.

Acknowledgements:

- If the data is used in analyses or used to create derivatives, or if derivatives of the data are used in digital or hard copy outputs then the following acknowledgement must be used:

Derived from Waikato Regional Council Provisional Significant Natural Areas data, 2007. Copyright Reserved.

- If the data is used in digital or hard copy outputs the following acknowledgment must be used (this acknowledgement must not be used for derivatives of the data):

Provisional Significant Natural Areas data sourced from Waikato Regional Council, 2007. Copyright Reserved.

Disclaimers:

The following disclaimers must be included with outputs, as indicated, that contain any part of this "Provisional Significant Natural Areas of the Waipa District (2007)" data set:

- Full disclaimer (must be included in reports and any data outputs other than maps):

The "Provisional Significant Natural Areas of the [District Name] District: Terrestrial and Wetland Ecosystems" data are derived from analysis and interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and limited field surveys. The data comprises an extensive yet provisional inventory and ranking of SNA of terrestrial and wetland ecosystems of the [District Name] District. It may be subject to revision through consultation with the [District Name] District Council or other appropriate sources. The Waikato Regional Council strongly advise that the data be used only in conjunction with subsequent field surveys, especially if the data will be used to help with decisions on resource consents, the development of district plan and regional plan schedules, or funding priorities. The data have been captured at scales of 1:10,000 or smaller and it is recommended it not be used at greater scales (e.g. 1:5,000) without detailed field survey. The absence of an existing natural terrestrial or wetland ecosystem area from the "Provisional Significant Natural Areas of the [District Name] District: Terrestrial and Wetland Ecosystems" data does not imply that such an area is not, or cannot be considered, a significant natural area, a significant area of indigenous vegetation or significant habitat for indigenous species. Such areas should be assessed when and if required.

- Short disclaimer (must be included in maps that display SNA boundaries and/or attributes):

Provisional Significant Natural Areas data are derived from interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and/or limited field surveys. The data are provisional and should be used for indicative purposes only. The data have been captured at scales of 1:10,000 or smaller and it is recommended it not be used at greater scales (e.g. 1:5,000) without detailed field survey.

- The standard Waikato Regional Council disclaimer must also be included in any maps or other data outputs produced by Waikato Regional Council:

While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury or expense (whether direct, indirect or consequential) arising out of the provision of this information or its use.

Status Information

Data Status:

As at 22 July 2011, the provisional data is considered 95% complete, subject to the limitations of a desktop study with limited field validation. There may be modifications to this original data set or a revised version of the data set should more information become available or should feedback, including that from Waipa District Council, DoC and/or other sources, including private landowners and field observations necessitates it. A number of attributes are yet to be populated and the provisional data could change significantly in some places, especially as a result of the Waipa District Plan review which is under way 2010-2012.

It is expected the data set will be reviewed or updated by EW at regular intervals depending on the availability of new aerial or satellite imagery. However, due to the large amount of work involved with such an inventory, this may only be in 5-10 year intervals.

Further Metadata Information

Related Information:

Boundary source data sets:

The following data sets were used for deriving the boundaries of the SNA_Waipa_2007_Provisional data set, and are cited in the BOUNDARY_SOURCE attribute of the data set. Each data set listed below includes the format of the citation in the BOUNDARY_SOURCE attribute, followed by the full name of the data set, and DOCS numbers for relevant metadata if available.

CRS_PARCEL_WAIPA (2010): "GIS_ALL.CRS_PARCEL_WAIPA" from CRS - GIS Layer, based on data supplied in 2010 (metadata: DOCS# 871640)

DoC (2010): "GIS_ALL.DOC_CONSERVATION_LAND_EW" from DoC - Conservation Boundaries, based on data supplied in 2010 (metadata: DOCS# 881142)

DoC (2010): DoC - Nga Whenua Rahui Kawenata (Covenant), based on data supplied in 2010 (metadata: DOCS# 1215463)

QEII Covenant Layer (2010): QEII National Trust Covenants - GIS Layer, based on data supplied in March 2010 (metadata: DOCS# 881117)

WPDC 2.2.1 (2010): Waipa District Council Section 2.2.1 Environmental Protection Lots GIS Layer based on data supplied 2010

Waipa DC Reserves (20010): Waipa District Council Reserves spatial data, 2010
WRAPS (2007): Aerial Photography - WRAPS 2007 - GIS Layer (metadata: DOCS# 1410510)

WRC Bioveg (2007): Waikato Regional Council Biodiversity Vegetation 2007 GIS Layer (metadata: DOCS# 1652753)

WRC Maungatautari Fenced Area (2007): Waikato Regional Council internal data mapping the external fence of Maungatautari Ecological Island Trust of WRAPS 2007 aerial photography.

Bibliography of primary information sources:

The following is a list of data sets, databases, reports, other literature, and personal observations that are cited in the REFERENCES attribute as the primary information sources (other than WRAPS (2007) and BIOVEG (2002)) used in the assessment of sites in the SNA_Waipa_2007_Provisional data set.

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Other Related Information:

The following is a list of references cited in the text of this metadata.

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General Notes:
This data set may be appended with SNA data sets of other districts or ecosystem types to form one region-wide SNA data set.

Document Links:

The following documents are closely associated with this data set and provide further detail on the background and methodology behind the assessment and inventory of significant natural areas in the Waikato Region.

Contract for Services: Inventory and ranking of significant natural areas of Waipa District (DOCS# 1646740).

Waikato Regional Council, Wildland Consultants Ltd 2002. Areas of significant indigenous vegetation and habitats of indigenous fauna in the Waikato Region: Guidelines to apply regional criteria and determine level of significance. Waikato Regional Council Technical Report TR2002/15. (DOCS# 791472).

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WWW Links:
None.

Need More Help?
Email the Dataset Administrator.

APPENDIX VI – Photos

Photo 1 Part of Mt. Maungatautari as viewed from B & S Garland's property

Photo 2 Mt. Pirongia from Waites Rd

Photo3 Mt. Kakepuku as viewed from the north

Photo 4 Private forest remnant at Te Miro

Photo 5 Unprotected kahikatea stand (Te Rahu)

Photo 6 Yarndley's' Bush (Te Awamutu)

Photo 7 Fenced QEII National Trust Open Space Covenant (Te Miro)

Photo 8 Council covenanted kahikatea stand (Te Pahu)

Photo 9 Wandering Jew repressing all native regeneration in podocarp stand (Te Pahu)

Photo 10 Privately owned and currently unprotected dense, mature podocarp broadleaved forest between Sanatorium Hill and Te Miro Scenic Reserve

Photo 11 Restored wetland on QEII covenant – Lake Maratoto

Photo12 Lake Ngaroto – restored by Waipa District Council and local Landcare group

Photo 13 Kahikatea in gully wetland retired from stock grazing

Photo 14 Lake Cameron – margin restored by local community

Photo 15 Moanatuatua Peat Bog (T. Roxburgh)

Photo 16 Lake Mangakaware (T Roxburgh)

Photo 17 Lake Rotopiko (T Roxburgh))

Photo 18 Yarndley's Bush

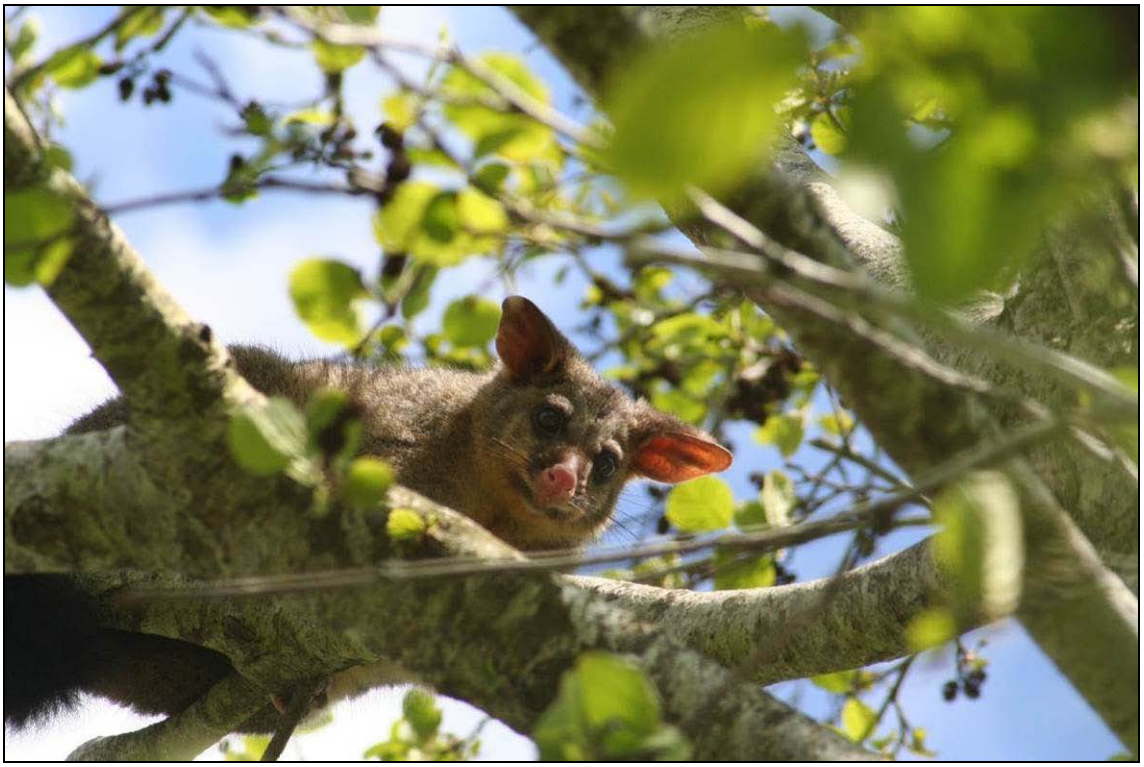

Photo 19 Possum

Photo 20 Kereru (*Hemiphaga novaeseelandiae*) in kowhai

Photo 21 Tui (*Prosthemadera novaeseelandiae novaeseelandiae*) in flax

Photo 22 Silvereye (*Zosterops lateralis lateralis*) in flax

Photo 23 Pukeko (*Porphyrio melanotus*)

Photo 24 New Zealand Bush falcon (*Falco novaeseelandiae* - Department of Conservation)

Photo 25 Forest gecko

Photo 26 A NZ copper butterfly species (*Lycacena rauparaha*)

Photo 27 Hochstetter's frog (*Leiopelma hochstetteri*) – recently discovered on Mt. Maungatautari (Patrick Stewart)

Photo 28 Last known kokako (*Callaeas wilsoni*) in Pirongia Forest Park (circa 1993)

Photo 29 North Island long-tailed bat (*Chalinolobus tuberculatus* - Darren Le Roux)

Photo 30 King fern (*Ptisana salicina*) – private covenant – Te Pahu

Photo 31 Forked sundew (*Drosera binata*) amongst Sphagnum moss in a private Waipa covenant

Photo 32 Fruiting swamp astelia (*Astelia grandis*) in a private covenant area

Photo 33 Future kahikatea forest