Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of rebuttal evidence of **Matiu Park** (Terrestrial Ecology and Herpetofauna) for the NZ Transport Agency

Dated: 26 October 2012

REFERENCE: John Hassan (john.hassan@chapmantripp.com)
Suzanne Janissen (suzanne.janissen@chapmantripp.com)

Chapman Tripp
T: +64 4 499 5999
F: +64 4 472 7111

10 Customhouse Quay
PO Box 993, Wellington 6140
New Zealand

www.chapmantripp.com
Auckland, Wellington,
Christchurch

TABLE OF CONTENTS

STATEMENT OF REBUTTAL EVIDENCE OF MATIU PARK FOR THE NZ TRANSPORT AGENCY

1 My full name is Matiu Corrigill Park.

2 I have the qualifications and experience set out at paragraphs 2-6 of my statement of evidence in chief, dated 5 September 2012 (*EIC*).

3 I repeat the confirmation given in my EIC that I have read, and agree to comply with, the Code of Conduct for Expert Witnesses (Consolidated Practice Note 2011).

4 In this statement of rebuttal evidence, I respond to the evidence of:

4.1 Expert witnesses on behalf of Greater Wellington Regional Council (*GWRC*) (submitter 684):

(a) Mr Tim Porteous (Biodiversity);

(b) Mr Richard Percy (Planning);

(c) Mr Peter Callander (Groundwater);

(d) Dr Ian Boothroyd (Freshwater);

(e) Mr Brian Handyside (Sediment); and

(f) Mr Alton Perrie (Freshwater).

4.2 Expert witnesses on behalf of Kāpiti Coast District Council (*KCDC*) (submitter 682):

(a) Dr Russell Death (Freshwater);

(b) Ms Shona Myers (Terrestrial/Mitigation);

(c) Mr Robert van Bentum (Sediment);

(d) Ms Emily Thomson (Planning);

(e) Mr Brydon Hughes (Groundwater); and

(f) Mrs Julia Williams (Landscape/Visual Effects).

4.3 Other submitters and experts:

(a) Ms Paula Warren (Ecologist) and Mr Christopher Horner on behalf of Ms Pomare (submitter 309);

(b) Ms Melanie Dixon (Ecologist) and Ms Jayne Staple on behalf of Raumati South Residents Association (*RSRA*) (submitter 707);

(c) Dr M E McIntyre on behalf of Action to Protect and Sustain our Communities (*APSOC*) (submitter 677);

(d) Mr Richard Birkenshaw on behalf of B MacKay and R Flatz (submitter 654);

(e) Ms Helen Rutter (Groundwater) on behalf of Christopher and Monica Dearden (submitter 261);

(f) Ms Mary Campbell-Cree on behalf of RSRA (submitter 707);

(g) Ms Beth Lindsay on behalf of Highway Occupants Group (submitter 542); and

(h) Ms Hariata Higgott (submitter 297).

5 The fact that this rebuttal statement does not respond to every matter raised in the evidence of submitter witnesses within my area of expertise should not be taken as acceptance of the matters raised. Rather, I rely on my earlier technical reports, my EIC and this rebuttal statement to set out my opinion on what I consider to be the key terrestrial ecological matters for this hearing.

6 Consistent with my EIC, I have referred to the MacKays to Peka Peka Expressway Project as "the Project" in this rebuttal evidence.

EXECUTIVE SUMMARY

7 I have read all of the statements of evidence provided by submitters in relation to terrestrial and wetland ecology. Overall, the evidence prepared by these submitters has not caused me to depart from the opinions expressed in my EIC. Overall, I consider my assessment of the ecological effects of the Project on terrestrial and wetland habitats is consistent with best practice and the mitigation requirements outlined are appropriate for the potential effects.

8 In my rebuttal statement I have acknowledged that there are still areas of uncertainty regarding the potential scale and magnitude of effects, particularly in relation to wetland hydrology. However, I consider that the monitoring and adaptive management approach that I have outlined in my assessment and related reports and in the proposed consent conditions, suitably acknowledges and addresses this risk.

9 I have proposed a number of amendments to consent conditions in response to a number of matters raised, largely in relation to ensuring an additional role for consent authorities in the adaptive management process and in determining potential associated consenting requirements.

EVIDENCE OF SUBMITTERS

General Comments

10 Firstly, I would like to clarify a number of key points that appear to have been misunderstood by the terrestrial and wetland hydrology experts for submitters.[1]

Stormwater Treatment Wetlands

11 Many submitters appear to have misunderstood the difference between 'stormwater treatment wetlands' and 'flood storage wetlands' despite my clarification in paragraph 193 of my EIC. As a result they believe that I am including stormwater treatment wetlands as mitigation.[2]

12 I can confirm that this is not correct. While a properly formed stormwater treatment wetland can provide habitat and value for indigenous flora and fauna, I have not included any of these in the calculations of mitigation for wetland loss. What are included are several large areas set aside along the Project alignment for offset flood storage. These areas are low lying and are currently seasonally flooded pasture or wasteland overlying peats.

13 Several of these areas are proposed to be developed or enhanced into functioning wetlands dominated by indigenous plant communities of varying types as part of the mitigation package. I believe this is appropriate and this approach is supported by experts.[3] The other areas, however, are to remain as grassed flood storage areas.

Non significant wetlands

14 Several submitters have suggested that I have undervalued a number of wetlands and have disregarded others as non-significant wetlands.[4] It is correct that in my assessment I consider wet depressions dominated by wet pasture species and rushland, or by weeds such as blackberry, to have little ecological value[5]. As a result I do not propose mitigation for their loss.[6] I believe this is appropriate as these communities are not indigenous, which is required by Policy 22 of the proposed Regional Policy Statement (proposed RPS).[7]

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1 Including Dr Boothroyd (for GWRC) at paragraph 8.14 and Ms Myers (for KCDC) at paragraph 6.20.

2 For example, Boothroyd (for GWRC) at paragraph 8.14 and Ms Myers (for KCDC) at paragraph 6.20

3 For example, Ms Myers for KCDC at paragraph 5.13.

4 For example, Mr Porteous for GWRC (at paragraph 33) in terms of wetlands overall; Ms Myers for KCDC (at paragraph 5.10) in relation to the Raumati Manuka Wetland, the Otaihanga Wetlands (north and south) and the El Rancho wetlands; and Ms Dixon (at paragraph 32) in relation to the Raumati Manuka Wetland.

5 Refer section 8.1.1 of Technical Report 26 (page 98).

6 These communities are labelled 2.01, 2.02 and 3.01 and are described in more detail in Technical Report 27, sections 3.1, and Appendix 27.I.

7 Policy 22 is discussed later in my evidence.

15 However, the areas that I identified as having little ecological value (that are likely to have been wetlands historically) provide significant opportunities for enhancement - and as a result I have focused on the use of these areas for mitigation planting and wetland restoration.[8] I believe this is an appropriate response and the focus on these areas for wetland mitigation is supported by other experts, including Ms Myers for KCDC.[9]

Wetland Hydrology

16 Several submitters have suggested that greater certainty is required on potential effects associated with changes to wetland hydrology.

17 I have relied on the advice of the Alliance hydrogeologists and ground water experts on this matter. The evidence of groundwater experts for the NZTA (Ms Williams), GWRC (Mr Callander[10]) and KCDC (Mr Hughes[11]) have confirmed that all research on wetland hydrology on the Kāpiti Coast highlights the complex hydrology of these systems.

18 All generally agree[12] that greater certainty cannot be provided by simple modelling and that appropriate monitoring of wetland hydrology is the most appropriate method to determine potential effects on these wetland systems, and by extension for determining whether any remediation or mitigation is required.[13]

19 There is also general agreement between these experts that any changes to groundwater as a result of the Project are likely to be minor[14]. In my opinion the monitoring is precautionary, which is appropriate, and the adaptive management process is appropriate.

GREATER WELLINGTON REGIONAL COUNCIL

Tim Porteous for GWRC

20 The evidence of Mr Porteous[15] raises the following key issues:

20.1 That the criteria used for the assessment of ecological significance are inconsistent with Policy 22 of the proposed Regional Policy Statement (proposed RPS);

20.2 That the ecological assessment failed to identify all areas of ecologically significant wetland;

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8 Refer section 8.1.1 of Technical Report 26 (page 98).

9 Refer paragraph 5.13 for example.

10 Refer paragraph 5 for example.

11 Refer paragraphs 3.4, 5.1 and 5.14 for example.

12 Refer for example Mr Hughes (paragraph 6.4(a)) and Mr Callander (at paragraph 53).

13 Refer for example, Mr Hughes for KCDC (paragraph 3.4), Mr Callander (paragraphs 5 and 26) for GWRC.

14 Refer to Mr Callander (paragraph 80) and Mr Hughes (paragraph 3.3).

15 Mr Porteous evidence at paragraphs 9 and 31.

20.3 That there is inadequate wetland mitigation proposed; and

20.4 That the approach undertaken by Mr Fuller and I to calculating mitigation is not in line with current best practice. This latter issue is addressed in the rebuttal evidence of **Mr Fuller**.

Policy 22 of the proposed RPS

21 During the time I prepared my assessment of ecological significance for Technical Reports 26 and 27 (2010-2012), Policy 22 formed a basis for that assessment, in addition to other matters.[16] The relevant wording of proposed Policy 22 at the time was that attached as Annexure D to my EIC. However, I note that during my assessment, Policy 22 was under appeal and I was not certain what the final provisions would be. This is also discussed in Mr Fuller's rebuttal.

22 Since then various changes have been made to the wording of Policy 22. I understand that the version of Policy 22 attached to Mr Porteous' evidence (Appendix III) is now contained in a Draft Consent Order currently before the Environment Court (filed in August 2012) but not yet determined.[17] The changes relate primarily to the introductory sentence, clauses (a) and (b) and the Explanation.

23 As a result, I accept that the criteria which I applied to assess ecological significance were not identical to those contained in the current version of Policy 22. However, in my opinion, my identification of ecological sites, areas of habitat for indigenous fauna and ultimately the assessment of effects remains consistent with the current wording of Policy 22.

24 Policy 22 takes a 'one or more' approach. That is, while it lists five significance criteria, a site only needs to meet one to be judged significant. The sand country of the Kāpiti Coast over which the Project alignment runs triggers the first criteria (that of Representativeness). This means that under Policy 22 all *"indigenous ecosystems and habitats"* that are located along the Project alignment are deemed to have significant indigenous biodiversity values.

25 This matches precisely the approach taken by my assessment of effects. I have identified all indigenous wetlands and terrestrial habitats, have attempted to avoid them wherever possible, and where they could not be avoided appropriate mitigation has been calculated. I discuss this further in the following section.

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[16] As explained in my EIC, paragraph 182. The other matters were the Kāpiti Coast District Plan schedule of sites of ecological significance; work Mr Fuller and I were undertaking for GWRC on a wetlands inventory and significance assessment; recent case law on criteria for assessing ecological significance; Land Environments of New Zealand (LENZ) threat classifications; priorities set out in the Wellington Conservancy Conservation Management Strategy (DOC, 2010); as well as the National Priorities for Protecting Rare and Threatened Indigenous Biodiversity (MfE, 2007).

[17] Porteous evidence, paragraph 22.

26 I note the acknowledgement of Mr Porteous[18] that the ecological assessment methodology used for this Project is broadly consistent with the work Mr Fuller and I undertook for GWRC in 2011[19] and which has informed GWRC's operational focus and future policy development. As noted in my assessment, that project provided much of the basis for our assessment of wetlands for this Project. I agree with Mr Porteous that this report did not establish a methodology for assessing ecological significance per se for the Wellington region (as Mr Porteous suggests I infer in paragraph 182 of my EIC).

27 Mr Porteous argues that my interpretation of 'representativeness' and use of 'distinctiveness' as a criteria were inappropriate.[20] I believe these arguments are irrelevant and academic given that firstly my assessment was carried out before the revised Policy was produced and, irrespective of that, my assessment remains consistent with the latest version of Policy 22 by assuming that all indigenous habitat within the Kāpiti Coast sand county is significant. Fundamentally, irrespective of what specific criteria are used for this area, the overriding criterion is the Land Environments of New Zealand (LENZ) threat classification which determines that all of the Kāpiti Coast sand country is significant - as outlined in my assessment.[21]

28 Mr Porteous also criticises my assessment of significance as it combines subjective scores (high, medium, low) for each of the significance criteria[22] to provide a single site score. He states that this is inconsistent with the 'one or more' approach outlined in Policy 22.[23]

29 In response, and as outlined by **Mr Fuller**, I would point out that an assessment of significance required by Policy 22 is only one part of an ecologist's role in a project of this nature. The division of ecological sites into high, medium and low value did not eliminate wetlands or terrestrial habitats from consideration, nor did this division influence my requirements for mitigation for habitat loss. The ranking of sites was used for the development of a constraints map which guided early stages of design of the Project alignment. This ensured a focus on avoiding the areas of highest ecological value wherever possible. It was also used for identification of potential ecological mitigation sites.

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18 Porteous evidence, paragraph 26.

19 Resulting in a Boffa Miskell report entitled 'Desktop Delineation and Assessment of Significance of Wetlands in the Wellington Region', as is attached to the statement of Mr Porteous (Appendix VII).

20 Porteous evidence, paragraphs 20-23.

21 The entire Project designation lies within 'Acutely Threatened Land Environments' (Leathwick et al 2002; Walker et al 2007) where less than 10 percent of indigenous vegetation cover remains (refer Table 10 of Technical Report 27 [page 65]).

22 I did not apply criteria (e) "*Tangata whenua values: the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori*" as this criteria is not ecological and it would be inappropriate for me to do so.

23 Porteous evidence, paragraphs 24-25. More specifically, he notes that Policy 22 currently states that "ecosystems and habitats will be considered significant if they meet one or more of the following criteria."

This is accepted practice for ecological effects assessments and is a task independent of ecological significance assessment.

30 Mr Porteous is also concerned that I considered 'condition' of terrestrial habitats as part of my assessment, stating that "indigenous vegetation and habitat condition should, in my opinion, be excluded when assessing significance from a policy perspective".[24] In response I would argue that for an ecologist to ignore the condition of a site when carrying out field work, developing constraints maps, and determining mitigation would be to ignore relevant and often vital information that is necessary to inform a complete analysis of a site and to inform the decision-making process. This would be contrary to accepted practice, and in my view would be negligent.

31 Overall, I consider that I have assessed significant habitats appropriately. My additional analysis of the ecological value was important to other aspects of my assessment work and Mr Porteous' criticisms suggest a lack of understanding of an ecologist's role in the shaping, design, effects assessment, and mitigation decisions for a project of this type.[25] Policy 22 of the proposed RPS only has a limited, though important, role within this spectrum of activities.

Significant wetlands and mitigation

32 Mr Porteous suggests that due to my incorrect interpretation of significance criteria, I have excluded a number of 'significant wetlands' from my assessment of effects.[26]

33 To correct this perceived oversight, Mr Porteous and his team have identified a total of 30.42 hectares of wetlands they believe to be significant and which are likely to be affected by the Project. This comprises:

33.1 2.71 hectares directly under the Project footprint; and

33.2 27.71 hectares within 200 m of the Project footprint.[27]

34 Mr Porteous then goes on to say that the NZTA should use the figure of 30.42 hectares "as the basis for designing the mitigation and offsetting proposed (not the 1.8 hectares it currently uses)."[28]

35 I disagree with Mr Porteous on all these matters.

36 Firstly, I am concerned that Mr Porteous appears to be working from a map and site listing of wetlands produced by Mr Fuller and myself in

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[24] Porteous evidence, paragraph 23.

[25] For example, consultation undertaken as part of the Project development has included that listed in **Annexure G**.

[26] Porteous evidence, paragraph 30.

[27] Porteous evidence, paragraph 30.

[28] Porteous evidence, paragraph 33.

2011 for a study to identify 'Regionally' Significant Wetlands[29]. This report was solely a desktop assessment that relied on a range of other data sources to locate potential wetland sites and map wetland extent using aerial photography at a scale of 1-5,000.

37 In comparison, my assessment for this Project mapped every wetland area, irrespective of value, that were observed by site visit[30]. Every site was visited and described before being mapped. For a number of wetland areas dominated by exotic plant species, but where indigenous species are also present, specific botanical surveys were undertaken to confirm value[31]. This means that the maps produced for this Project, and those produced for the GWRC project, cannot be compared directly. It is my view that because we have visited each site, the delineation we have used is more accurate.

38 In addition, I am aware based on my field work that none of the additional wetlands included by GWRC are predominantly indigenous, and they therefore do not fall within my interpretation of Policy 22 of the proposed RPS[32]. They are seasonally flooded pasture or weed-lands dominated by pasture grasses, exotic rushes, vine weeds, and herbaceous weeds. Where indigenous plant species occur, they are not dominant and are species typically seen in areas of pasture which are tolerant of browsing, trampling and enrichment by stock effluent. I consider I made this clear distinction of the two broad groups of wetland in section 8.1.1 of my assessment (page 98).[33]

39 I note that GWRC's own draft guideline for identifying wetlands in the Wellington region[34] states that "*wet pastures, including pasture that supports patches of rushes (Juncus spp.) are not considered to be wetlands",* nor is an area with *"temporarily ponded rainfall"*.

40 My approach is also consistent with the recent Horizons One Plan decision of the Environment Court[35] (referenced by Mr Porteous at paragraph 23). In addition to defining the term 'indigenous',[36] the One

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[29] Refer to the Boffa Miskell report entitled 'Desktop Delineation and Assessment of Significance of Wetlands in the Wellington Region' attached to the statement of Mr Porteous (Appendix VII).

[30] Refer Technical Report 27 Table 7 (page 52) and Figures 9a – 9d (vegetation communities.

[31] Refer for example, Technical Report 27 Appendix 27.I for a site specific species list of the Ngarara Dune Depressions (GWRC name: 'Unsurveyed Site 5').

[32] The proposed RPS for the Wellington Region includes the following definition for 'indigenous': "originating naturally in a region or area". The definition of 'ecosystem' in the proposed RPS is similarly broad, being 'Any system of interacting terrestrial and/or aquatic organisms within their natural and physical environment".

[33] Technical Report 26.

[34] GWRC Draft document dated 20 September 2006 (prepared by Melanie Dixon). This is attached as **Annexure C** to this rebuttal evidence.

[35] *Day v Manawatu-Wanganui Regional Council* [2012] NZEnvC 182.

[36] The introduction to Schedule E of the One Plan states: "Unless otherwise stated, the habitat types in Table E.1 comprise vegetation that is indigenous*. Indigenous* is defined in the Glossary of the Plan for the purposes of Schedule E and means vegetation

Plan specifically included a range of detailed indigenous habitat descriptions for wetlands. Most notably, the decision confirmed Schedule E which specifically excludes as wetland habitat the following: *"Damp gully heads, or paddocks subject to regular ponding, dominated by pasture or exotic species in association with wetland sedge and rush species".*[37]

41 As discussed earlier, at the time I was carrying out my assessment, I was also assisting Mr Fuller with development of a regional wetlands inventory and significance assessment for GWRC.[38] Policy 22 was still under appeal at the time, and was a generic policy relating equally to all indigenous ecosystems and habitats. As a result, we also considered the more specific significance criteria for wetlands that had been developed as part of the *Shearer Swamp* decision[39] and which were, in our view developing best practice for wetland assessment.

42 In my view, consideration of each of these assessment methods ensured my assessment of wetlands went beyond proposed Policy 22 and considered key aspects relevant to wetlands.

43 In order to provide further confirmation that our mapping and analysis is not inconsistent with Policy 22 of the proposed RPS, the following table addresses this matter.

Wetland loss beneath the Project footprint

44 Table 1 below outlines the wetlands I have identified based on field mapping, which will fall under the Project footprint and which will therefore be directly affected. This is compared with those sites identified by GWRC from a desktop study, and used in their identification of Policy 22 wetlands in Mr Porteous' evidence.[40]

Table 1: Directly affected wetlands

Name	Calculated Loss	Indigenous / non-indigenous	Mitigation required by NZTA Assessment	Identified by GWRC (Porteous Appendix X)
Queen Elizabeth Park peatlands[41]	4.26 ha	Non-indigenous - rushland over pasture	No mitigation	No

comprised predominantly of indigenous species, but which may include scattered* exotic species".

37 Refer Schedule E 'Indigenous Biodiversity' of the proposed Horizons One Plan as referred to in *Day v Manawatu-Wanganui Regional Council* [2012] NZEnvC 182.

38 Refer my EIC, paragraph 182.

39 *Friends of Shearer Swamp Inc v West Coast Regional Council* [2010] NZEnvC 354.

40 Mr Porteous' evidence, paragraph 30. I note that Mr Porteous does not specifically refer to individual wetlands, but includes a layer in his Appendix X.

41 Note: the assessment of QE Park took into account the grazed peatlands adjacent to the existing SH1 and Poplar Ave. Poplar Ave wetlands and other identified ecological areas within the Regional Park were not considered as part of this assessment, although they were the site of botanical surveys.

Name	Calculated Loss	Indigenous / non-indigenous	Mitigation required by NZTA Assessment	Identified by GWRC (Porteous Appendix X)
Raumati Manuka Wetland	**0.03 ha**	**Indigenous**	**Yes**	**Yes**
Kiwi Pond	0.23 ha	Non-indigenous - rushland over pasture	No mitigation	No
Southern Otaihanga Wetland	**0.55 ha**	**Indigenous**	**Yes**	**Yes**
Middle Otaihanga Wetland	0.46 ha	Non-indigenous - weedland	No mitigation	Yes
Northern Otaihanga Wetland	**0.53 ha**	**Indigenous**	**Yes**	**Yes**
Open water and Juncus south of Waikanae River.	0.16 ha	Non-indigenous - rushland over pasture	No mitigation	No
El Rancho Wetland (Weggery)	**0.38 ha**	**Indigenous**	**Yes**	**Yes**
Tuku Rakau Wetland	**0.04 ha**	**Indigenous**	**Yes**	No
Ngarara Road Wetland A	0.17 ha	Non-indigenous - rushland over pasture with *Cyperus ustulatus*	No mitigation	**Yes**
Ngarara Wetland (GWRC Ngarara Rd wetland D)	**0.00 ha**	**Part Indigenous** (area in footprint is blackberry)	**Yes** – edge planting	**Yes**
Small area of wetland vegetation on Ngarara Farm adjacent to Ferndale	**0.04 ha**	**Indigenous**	**Yes**	No
Small area of *Cyperus ustulatus* wetland on Ngarara Farm just south of Ngā Manu access road	**0.08 ha**	**Indigenous**	**Yes**	No
Ngarara Dune Depressions (GWRC un surveyed site 5)	1.03 ha	Non-indigenous - rushland over pasture	No mitigation	**Yes**

45 In summary, Table 1 illustrates that I identified 14 wetland areas that will fall at least in part under the footprint of the Project. Of these, 8 areas comprise indigenous habitat and were therefore treated as significant, and mitigation has been provided for the proposed loss.

46 By comparison, the evidence of Mr Porteous identifies 8 sites, all of which he determines are significant. However:

46.1 Our surveys have confirmed that 3 sites identified by GWRC are not indigenous (i.e. Middle Otaihanga Wetland, Ngarara Road Wetland A and Ngarara Dune Depressions);

46.2 Three of the wetlands that we have identified by field survey and consider significant - and which we are proposing mitigation for - have not been identified by GWRC (i.e. Tuku Rakau Wetland and two areas on Ngarara Farm).

47 As outlined in Table 1 above and in my assessment, the figures that made up my 1.8 ha were based on indigenous wetland vegetation communities,[42] rather than already identified and named wetlands from previous inventories (although this analysis was also undertaken[43] as part of my assessment).

48 More specifically, the key difference between my 1.8 ha figure and the 2.71 ha of wetland identified by Mr Porteous as potentially lost within the Project footprint relates primarily to the following reasons:

48.1 Mr Porteous has included the Ngarara Dune Depressions (GWRC name: 'Un-surveyed Site 5') as significant indigenous wetlands. I assessed this area to have low ecological value (refer Table 21 of Technical Report 26) consistent with Mr Fuller's and my assessment of this area for GWRC[44] and this area was therefore excluded from my calculation of wetlands requiring mitigation. The Ngarara Dune Depressions are illustrated in the photographs attached as **Annexure B** and the botanical species lists in Technical Report 27.[45]

48.2 Mr Porteous has included part of the Ngarara Road Wetland A (GWRC name) as significant wetlands. I assessed this area as 'wet pasture with Juncus' and this area was therefore excluded from my calculation of wetlands requiring mitigation.[46]

48.3 Mr Porteous has included part of the Ngarara Wetland (GWRC name: 'Ngarara Road Wetland D') as significant wetlands, despite my vegetation mapping identifying this particular area as blackberry weedlands.

48.4 Finally, Mr Porteous has included the Otaihanga Middle Wetland as significant wetland. I assessed this area as low ecological value, primarily comprising exotic weedlands and this area was

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42 Refer Table 11 of Technical Report 26 (page 43) and Tables 6 and 7 of Technical Report 27 for example.

43 Refer to Table 11 of Technical Report 27 (page 68).

44 Refer to the 2011 report for GWRC 'Desktop Delineation and Assessment of Significance of Wetlands in the Wellington Region' attached to the statement of Mr Porteous (Appendix VII), where this area was characterised as 'Wetlands of limited value that may be significant at a District level'.

45 Refer Appendix 27.I.

46 Refer to the 2011 report for GWRC 'Desktop Delineation and Assessment of Significance of Wetlands in the Wellington Region' attached to the statement of Mr Porteous (Appendix VII), where the Ngarara Road Wetland A was assessed in the category of 'Wetlands that may not be significant or insufficient information'.

therefore excluded from my calculation of wetlands requiring mitigation[47].

49 I have attached to my evidence (as **Annexure A**) a series of maps outlining the different interpretation of significant wetlands and non-significant wetlands (predominantly exotic rushland in pasture), as well as some photographs illustrating these wetland areas (**Annexure B**).

50 Based on the above, I do not consider the additional areas of wetland identified by Mr Porteous within the Project footprint constitute significant indigenous vegetation that requires mitigation. As supported by Ms Myers paragraph,[48] I agree that these areas of predominantly pasture dominated by exotic rush species have ecological potential and they have been assessed on this basis [refer section 8.11 of Technical Report 26 for example].

200m wetland buffer

51 Mr Porteous argues that in addition to wetlands that lie beneath the Project footprint, all other wetlands that lie within 200m of the Project footprint will experience significant adverse effects from changes to hydrology and mitigation should be provided for this effect.[49] Mr Porteous provides a map and has calculated that an additional 27.1 ha of 'significant wetlands within 200 metres of the Project footprint' will be affected[50].

52 The distance of 200m which Mr Porteous uses is derived from the summary of potential groundwater effects (Technical Report 26, Section 9.1) which I quote in my assessment as follows:

> The Groundwater Assessment of Groundwater Effects (Technical Report 21, Volume 3) established that drawdown effects in peat layers will occur on the down gradient side of the proposed Expressway, but this effect will decline significantly with distance from the proposed Expressway and from associated storm water devices. Specifically, 2-D models showed a generic drawdown in the peat of 20 cm at a distance of 20 m, and a 5 cm drawdown at a distance of 200 m.

53 I go on to state:

> While the modelling discussed above provides confidence that there will be minimal effects on wetlands at a broad scale, we remain concerned about localised effects on wetlands that abut, or are severed by the Alignment. In our view localised reductions in groundwater levels of 20 cm would have

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47 Refer to the 2011 report for GWRC 'Desktop Delineation and Assessment of Significance of Wetlands in the Wellington Region' attached to the statement of Mr Porteous (Appendix VII), where the Otaihanga Middle Wetland (GWRC: Otaihanga Landfill Central) was assessed in the category of 'Wetlands that may not be significant or insufficient information'.

48 Myers evidence, paragraph 5.13.

49 Porteous evidence, paragraph 27.

50 Porteous evidence, Appendix X.

> significant adverse effects on a wetland. A reduction of 5 cm is less likely to have a measureable effect.
>
> We conclude from this that any wetland that lies immediately adjacent to the proposed Expressway will suffer from groundwater drawdown that will have a measurable adverse effect upon it. This effect diminishes with distance and any wetland areas beyond 200 m wetlands will be buffered from this change. The incorporation of the starter drainage layer of granular engineered fill as part of the pre-load and surcharge embankment construction is anticipated to maintain existing hydraulic cross-flows within these wetlands severed by the proposed Expressway.

54 Therefore Mr Porteous' interpretation of our assessment is in error. We did not say all wetlands within 200 m of the road will be adversely affected. Our assessment, based on the advice of the Project hydrologists, was that a wetland needed to be directly connected, lie adjacent to or be severed by the Project, for these moderate to high effects to be experienced.[51] With the guidance of the groundwater experts, I identified those indigenous wetlands that met this criteria and assessed each accordingly.

55 I note that all groundwater experts agree that while there is a risk of potential changes to groundwater levels, they also agree that any change is likely to be relatively small scale.[52] For example, Mr Hughes (witness for KCDC) notes that any changes to groundwater associated with the Project will be occurring in an area with an overall seasonal variation of between 0.4 and 0.5 metres.[53] **Ms Williams** addresses this in more detail in her rebuttal.

56 The Project team's approach to managing risk at each of these wetlands was to establish, in collaboration with the groundwater experts, a comprehensive monitoring regime.[54] If a measureable effect is identified at any wetland site, adaptive management will be instigated with the goal of eliminating or reduce that effect.[55] If adaptive management cannot remedy effects, mitigation would then be required, and the scale of mitigation would be determined to be commensurate with the effect that is measured. Proposed conditions G.34(d) vii and xii and G.40 reflect this approach.

57 I note that Mr Hughes (KCDC groundwater expert) supports the hydrological characterisation and monitoring of the wetlands identified

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[51] Technical Report 21, Assessment of Groundwater Effects, 3D groundwater modelling of wetlands Figures 7 and 8, and Sections 4.5, to 4.8 and Section 5.

[52] Refer for example Callander (paragraph 5-6 and 80) and Mr Hughes (paragraph 3.3).

[53] Mr Hughes states that this hydrograph response is similar to that observed in other monitoring sites screened in the Holocene sand aquifer along the Kāpiti Coast. Mr Hughes' evidence, paragraph 5.7.

[54] CEMP Appendix 1, Groundwater Management Plan, Section 5.2.

[55] Technical Report 21, Section 7.2, Mitigation strategies for potential effects on groundwater.

in the Ecological Impact Assessment as potentially at-risk of Project-related changes in groundwater level.[56]

58 I have also recommended amendments to proposed Condition G.40(c) (shown in **Annexure D** to my rebuttal evidence) to ensure GWRC involvement in the decision-making process during adaptive management and to ensure certainty that mitigation will be undertaken for any long-term adverse effects on wetland hydrology.

59 A number of adaptive management techniques are available to eliminate or minimise potential adverse effects of changes to hydrology and these are outlined in my assessment.[57] Minimising effects should be a priority over mitigation - as mitigation for loss or modification to a wetland community is unlikely to achieve an equivalent habitat in the short to medium term. Irrespective of the outcome, I have calculated below that sufficient opportunities for mitigation exist within the designation to ensure any measured effect on indigenous wetlands can be successfully mitigated if required.

60 Returning to Mr Porteous' evidence, his argument that the NZTA must mitigate for the adverse effects on every wetland within 200 m of the alignment[58] assumes that every wetland within 200 m of the alignment will be *"potentially very highly or moderately affected."* In addition, his calculations of wetland loss include a number of areas that (as described above) are not indigenous and do not, in our view, comprise significant wetlands under the RMA section 6(c) or Policy 22.

61 As discussed above, I do not accept that all wetlands within 200 m of the Project footprint will be adversely affected. This is not in my view a worst case or even a possible scenario.

62 However, for the sake of argument, if all wetlands identified by the NZTA hydrologists as being at risk are irrevocably lost or affected (and I do not accept that they will be), the total area of wetland requiring mitigation would be 16.3 ha.[59] Applying the 3:1 environmental compensation ratio I have used for this Project (and taking into account the 5.4 ha of wetland mitigation already recommended), this would require a further 43.5 ha of wetland restoration as mitigation. I believe sufficient mitigation opportunities would be available (if needed) within the designation area, including the following areas:

62.1 Approximately 18.9 ha of flood offset storage area is proposed for indigenous re-vegetation;

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[56] Hughes evidence, paragraph 6.5.

[57] Technical Report 26, sections 11.4.1 (page 146) to 11.4.5 (page 148).

[58] Porteous evidence, paragraph 33.

[59] Not 27.61 ha as asserted by Mr Porteous. Refer Table 40 of Technical Report 26. This table comprised 2.0 ha of Raumati Manuka Wetland, 2.4ha of the Otaihanga Northern and Southern wetlands, 3.9 ha of the El Rancho Wetland (Weggery), 0.3 ha of the Tuku Rakau Wetland, 1.3 ha of the Osbournes Swamp, 3.7 ha of the Ti Kouka Wetland and 2.7 ha of the Ngarara Wetland (totaling 16.3ha).

62.2 Approximately 14 ha of wet swales are proposed for indigenous re-vegetation;

62.3 Approximately 7.8 ha of flood offset storage (grassed) could be revegetated with wetland plants;

62.4 Approximately 1.8 ha of the remaining area of the Otaihanga Central Wetland could be revegetated with wetland plants; and

62.5 Finally, there are large areas of wet pasture and rushland in peat between the Paetawa Stream and Peka Peka Road that could also be utilised if required.

63 In addition, outside of the designation, potential mitigation works at the Oxidation ponds would only enhance a proportion of the available area (approximately 3.8 ha of restoration is proposed within an area of approximately 12 ha[60]), making 8 ha potentially available for ecological mitigation, if required.

64 Finally, GWRC has requested NZTA to restore a large area of wet pasture and rushland within Queen Elizabeth Park adjacent to the Project (in accordance with GWRC's Sustainable Land Use Plan - refer Sharon Lee evidence, Appendix 4). This area could also be used as wetland mitigation.

Richard Percy for GWRC

65 In his evidence, Mr Percy's key issues on terrestrial ecological matters relate to confirmation as to whether further resource consents may be required to facilitate any future mitigation works – in particular for mitigation for effects on wetlands.[61]

66 At paragraph 42, Mr Percy considers that further information should be provided regarding the construction methodology for the restoration of the Waikanae Oxidation Ponds to determine the need for, and potential complexity of, other consents. **Mr Schofield** addresses this matter in his rebuttal.[62]

67 At paragraph 44, Mr Percy notes Mr Callander's concerns that some of the mitigation measures described in the Groundwater (Level) Management Plan may require "additional require consents". Given that any mitigation will occur as part of an ongoing adaptive management process, it is unlikely the precise form of mitigation can be anticipated in advance, and therefore it seems appropriate that any required consents be sought at an appropriate time. I consider this to be suitably addressed by Ms Ann Williams' proposed Condition GD.2.

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[60] Wildlands. 2011. Pharazyn Reserve Landscape and Ecological Restoration Plan. Report prepared for Kāpiti Coast District Council. Contract Report No. 2527.

[61] Percy evidence, paragraphs 41-46.

[62] Mr Schofield also addresses paragraph 43 of Mr Percy's evidence (i.e. confirming that no consents are required for restoration works proposed in the Ngarara Wetland and the Otaihanga Coastal Wetland).

68 However, as shown in **Annexure D**, I have recommended an amendment to proposed Condition G.40(c) to provide a greater role for GWRC in management of potential adverse hydrological impacts on wetlands in order to address GWRC's concerns.

69 In his discussion on environmental management plans and adaptive management, Mr Percy seeks confirmation that sufficient offset mitigation is available for the potential loss of wetlands adjacent to the Project [paragraph 56]. I respond to this in detail in my response to the evidence of Mr Porteous (above). In short, I believe that there is sufficient scope within the proposed designation for mitigation of any likely adverse effect on significant wetland systems outside of the designation.

70 Mr Percy cites the evidence of Mr Porteous regarding the application of proposed Policy 22 to support a conclusion that NZTA has underestimated the total area of ecologically significant wetlands directly and potentially affected [paragraph 75]. I have addressed these concerns in some detail in paragraphs 45 to 50.

71 As noted by Mr Percy [paragraph 77], I have recommended a consent condition in **Annexure D** which requires the review of mitigation calculations in the event of additional wetland loss.[63] Mr Percy's position is that before such a condition can be applied, "there needs to be certainty that there are adequate areas available for offset mitigation, should the worst case effects scenario eventuate." I have responded to this in paragraphs 60 to 61 earlier.

Triggers for wetland mitigation

72 In his discussion on the availability of wetland mitigation sites within the designation, Mr Percy[64] raises the issue of the need for a threshold change in hydrology to trigger mitigation.

73 **Ms Williams** has responded to this issue in her rebuttal of Mr Callander's suggestion to reduce the Alert Levels proposed to 0.1 m (paragraph 90). Specifically, Ms Williams notes that the natural variation recorded in recently installed monitoring wells is typically in the range of 0.5 to more than 2 m and considers that natural variability is most likely to exceed that of a single 12 month period of measurements. I agree with Ms Williams that the best approach would be to identify more specific Alert Levels for different sets of piezometers located in different wetland areas, with reference to the natural water level variation recorded in the pre-construction period for any given piezometer. This would be a better method for setting Alert Levels and adaptive management trigger levels.

74 Given the possible time lags by which any changes are likely to be observed in wetland vegetation, I also agree with **Ms Williams'** rebuttal of Mr Callander that, rather than establish an Action Level, for

[63] Refer proposed Condition G.34(d)(xii).

[64] Mr Percy's evidence, paragraph 78.

which selection of a meaningful value is difficult, it would be preferable to implement mitigation in response to demonstration of likely adverse effects as indicated by the more intensive ecological and groundwater assessments that would be triggered by the Alert Level.

75 To ensure the hydrological monitoring outlined above is coupled with ecological monitoring of wetlands, my assessment also recommended[65] that Wetland Condition Monitoring[66] be undertaken at the wetlands identified as being potentially at-risk of hydrological changes. The goal of this monitoring is to provide an ecological baseline condition as part of assessing vulnerability of individual wetlands to a decline in water levels. It may be that a small change in hydrology does not have an associated effect on the wetland habitat. This monitoring is necessary to confirm that an effect has been caused, and to determine the extent of the effect – before undertaking adaptive management responses and/or requiring mitigation.

76 I have addressed what I consider to be the relevant ecological conditions outlined in Mr Percy's Appendix 1 (suggested amendments to draft conditions dated 14 September 2012) in **Annexure D**.

Peter Callander for GWRC

77 Mr Callander[67] concurs with Ms Williams that any groundwater level changes are likely to be of a reasonably small scale. Consistent with my assessment, he also agrees that those small changes may still result in adverse effects, particularly for wetlands close to the Project and close to new excavated stormwater storage structures.
Mr Callander also notes that there is a reasonable degree of uncertainty associated with such predictions due to the heterogeneity of the strata which cannot be adequately characterised within a numerical model.[68] I consider this statement is consistent with my precautionary approach to potential effects on wetlands.

78 I have addressed Mr Callander's suggestion regarding an appropriate 'Alert Level' for hydrological changes to initiate adaptive management options and/or determine mitigation in response to demonstrations of likely adverse effects (paragraph 90) in paragraphs 73 and 74 earlier.

Dr Boothroyd for GWRC

79 At paragraph 8.14 of his evidence, Dr Boothroyd states his caution of accepting that stormwater treatment wetlands and their connections to waterways form part of mitigation for the Project.

80 In response, I confirm that stormwater treatment wetlands have not been used for mitigation and suspect Dr Boothroyd has misunderstood

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65 Refer section 11.7.8 of Technical Report 26.

66 Clarkson, B.R., Sorrell, B.K., Reeves, P.N., Champion, P.D., Partridge, T.R, and Clarkson, B.D. 2003 (rev. 2004) Handbook for Monitoring Wetland Condition. Landcare.

67 Callander evidence, paragraphs 5-6.

68 Ibid at paragraphs 5 and 26.

the distinction between stormwater treatment wetlands and flood storage areas. (Refer to discussion earlier in my evidence.)

Brian Handyside for GWRC

81 At paragraph 51 of his evidence, Mr Handyside disagrees with my statement that there is a small potential risk of sediment entering and accumulating in the Te Harakeke/Kawakahia wetland via the Ngarara Streams (paragraph 101 of my EIC). Mr Handyside states that the comparative approach to sediment generation taken by the Project for the catchment assessment is not valid and that catchment sediment is likely to be different to that estimated by the USLE model.

82 **Mr Ridley** and **Mr Keesing** respond to this matter in their rebuttal evidence.

KĀPITI COAST DISTRICT COUNCIL

Shona Myers for KCDC
Effects on wetlands

83 In her evidence [paragraph 5.2], Ms Myers strongly supports the approach that I have used to avoid loss of wetland (10 significant wetlands) and terrestrial habitats (6 areas of regenerating forest).

84 Ms Myers states that, as well as significant habitat loss, there will be "significant hydrological impacts" on any remaining parts of the Otaihanga North and Otaihanga South wetlands[69]. I do not consider there is sufficient evidence to make this statement and note that groundwater modelling indicates that the effect on flow directions, particle travel times and water levels is minor.

85 Discussions with Mr Levy (hydrology and stormwater) suggest that full surface water connections will be retained between the eastern and western remnants of the Southern Otaihanga Wetland (via culvert 16) and therefore any effects on surface water hydrology is minor. In regard to the Northern Otaihanga Wetland, Mr Levy notes that there is a minor change to the proposed surface water hydrology here as a result of the truncation of the upper portion of the northern arm of this wetland. However, Mr Levy advises that the truncated area is quite small relative to other runoff to this arm from the east (landfill), which would result in a minor change in catchment area.

86 In considering Mr Levy's advice, as outlined in Technical Report 27[70], both of the Otaihanga wetlands have historically been the subject of considerable hydrological modification associated with the adjacent Otaihanga landfill, access tracks, and draining. This is clearly visible in the die-back of some of the manuka in this area and a dramatic change in vegetation from manuka-dominated wetland to *Carex* sedgeland visible in aerial photos flown in 1967 and 1987 (refer

[69] Myer evidence, paragraph 5.8,

[70] Refer Appendix 27.F, Unprotected sites of ecological value beneath or in close proximity to the MacKays to Peka Peka Expressway Designation.

Annexure E of my rebuttal evidence). These photos illustrate how dramatic the changes to these wetlands have been. The wetlands have persisted but evolved to a more tolerant sedgeland with large areas of open water and it is our intention to monitor and enhance these sites.[71]

87 At paragraph 5.10, Ms Myers disagrees with my assessment that the two Otaihanga wetlands and the Raumati Manuka wetland are of medium ecological significance, citing her opinion that these would meet the criteria for significance under Policy 22 of the proposed RPS. This is an academic argument. As outlined in my rebuttal of Mr Porteous (above), I agree that these wetlands meet the criteria of significance under Policy 22 and I have proposed mitigation for loss accordingly. However, as I discuss above [paragraph 29] this assessment of medium ecological significance does not alter my consideration of their ecological importance relative to other wetlands on the Kāpiti Coast, nor does it alter my consideration of the mitigation requirements for adverse impacts on these areas.

88 At paragraph 5.10, Ms Myers surmises that three of the wetlands affected under the Project footprint are not identified in the Kāpiti Coast District Plan schedule of significant sites (prepared by Wildlands Consultants) because of their location within the proposed designation. While I am unsure of the reasoning for this, I note that a large number of other wetlands within the existing Western Link Road designation were scheduled in the District Plan.[72]

89 At paragraph 5.11, Ms Myers considers my overall ranking of the ecological areas in proximity to the proposed Expressway (in Table 10 in Technical Report 26) as inappropriate. I have addressed the issue of site ranking in my rebuttal to the evidence of Mr Porteous [paragraphs 28 to 29].

90 At several places [for example paragraphs 5.12], Ms Myers disagrees with my conclusion that 1.8 ha of wetlands will be destroyed by the proposed Expressway and states that this figure is not consistent with the total area of wetlands (7.67 ha) identified as lying within the footprint in Table 11 in Technical Report 27. I have addressed the issue of non-indigenous wetlands in my rebuttal to the evidence of Mr Porteous [paragraphs 44 to 50]. I reiterate that the 6.14 ha of the rushland and wet pasture and weedland vegetation communities that

[71] As is set out in the GWMP which requires specific monitoring of piezometers in the vicinity of this wetland and a number of ecological conditions to minimise effects on this area. For example G.34(d) which requires minimising loss of valued vegetation and habitats and minimising effects on identified wetlands resulting from hydrological changes to water tables.

[72] For example, parts of the following Kāpiti Coast District Plan scheduled wetlands are located within the existing Western Link Road Designation: 131 Raumati South Peatlands (KCDC K131), El Rancho Wetlands (Weggery, West, Takamore) (combined as KCDC K170), Osbournes Swamp (KCDC K068), Osbournes Swamp West (KCDC K170), Te Harakeke Wetland, Kawakahia Swamp Forest and Ti Kouka Wetland (combined as KCDC K066).

make up the majority of this 7.67 ha provide much of the proposed mitigation areas for wetland loss associated with the Project.

91 It is notable that Ms Myers in her following paragraph (paragraph 5.13) does not state that the rush and wet pasture vegetation communities I excluded from my calculation of wetland requiring mitigation were ecologically significant, only citing their potential as wetland buffers and potential connections to other wetlands, as well as important hydrological values within the dune systems. Ms Myers states that remaining areas of these wetlands could be used to restore wetland systems as mitigation for loss of wetlands within the Project area. This is in fact what is proposed at several sites (for example the large planted flood storage areas south of the Wharemauku Stream and north of the Kakariki Stream).

92 At paragraph 5.17, Ms Myers states that there will be downstream impacts of sediment and stormwater discharge on the Te Harakeke/Kawakahia Wetland and the Waikanae estuary. These potential affects are addressed in the rebuttal evidence of **Drs Keesing** and **De Luca**.

Effects on indigenous forest and shrublands

93 At paragraph 5.19, Ms Myers' disagrees with my assessment of the Waikanae riparian forest as being of low ecological value, stating that this forest has very important ecological values and provides riparian protection for the Waikanae River. I disagree and note that all of the planting proposed to be removed has been undertaken in the last 5-7 years. However, the planting in this area does attest to the success of well planned restoration planting and confirms that within 5-7 years the extensive re-vegetation planned for this Project can develop to have 'moderate' ecological values as attested to by Ms Myers.

94 At paragraph 5.20, Ms Myers disagrees with my assessment of the areas of indigenous forest and shrubland and considers all these areas are of regional significance, due to the extent of loss of indigenous vegetation in the Foxton Ecological District. As outlined in my discussion of Policy 22 in my rebuttal of Mr Porteous, this is the outcome of this Policy and I have assessed all indigenous vegetation and habitats accordingly.

Mitigation for Loss of Wetlands

95 At paragraph 6.19, Ms Myers' support the type of restoration proposed for the Project, but recommends that mitigation for wetland loss should include increased levels of wetland restoration in other parts of the Project area, including expansion, where possible, of wetland areas and buffers to be affected by the proposal. Ms Myers suggests that this could also involve restoration of currently grazed rushland habitats that have the potential to be restored. I agree with this statement and reiterate that this type of restoration is proposed – with a focus on grazed rushland habitats (e.g. planted flood storage areas south of the Wharemauku Stream and north of Kakariki Stream). Ecological

restoration is also heavily focused on improvement of ecological linkages and corridors as suggested by Ms Myers [paragraph 6.19].

96 Ms Myers goes on to state that the intended use of flood storage areas is unlikely to provide mitigation for the wetland types and hydrology and natural character of wetlands which will be destroyed [paragraph 6.20], citing research on the poor water quality of constructed ponds. I disagree and consider this is inconsistent with her statement at paragraph 5.13 where she suggests that remaining areas of these wetlands could be used to restore wetland systems as mitigation for loss of wetlands within the Project area. Nonetheless, as discussed earlier in my evidence,[73] my assessment clearly noted that the Project's intention is to restore key flood storage areas as wetlands, not stormwater treatment ponds. Her concern is therefore unfounded. **Annexure F** illustrates the nature of the intended offset flood storage areas.

Impacts on the hydrology of wetlands

97 Ms Myers supports the proposed monitoring of wetland hydrology, but recommends the development of a baseline of the natural hydrological and ecological character of the wetlands so that any changes can be assessed against this baseline [paragraph 6.24]. As outlined in section 11.7.8 of Technical Report 26, I have recommended wetland condition monitoring in concert with hydrological monitoring to provide a baseline for the monitoring of trends.[74] To ensure this is addressed, I have recommended that proposed Condition G.34(d) be amended to specifically require wetland condition monitoring be undertaken prior to construction in all the wetlands which I have identified as being at risk of potential Project-related hydrological changes.[75]

98 Ms Williams and I agree that the EMP and GMP should be developed in parallel and that incorporation of GWRC in deciding the need for and agreeing suitable mitigation, is desirable. In her EIC, Ms Williams addresses Ms Myers' recommendation to extend the monitoring of groundwater levels for a period of 5 years for those wetlands outlined in the GMP following construction.[76]

99 In her discussion on proposed Condition G.40, Ms Myers recommends that any assessment and review of whether the hydrology of wetlands is adversely affected, and whether or not it can be attributed to the effects of the Project, should be peer reviewed by representatives from independent authorities with expertise in wetland hydrology [paragraph 6.25]. I agree. Ms Myers goes on to suggest that this could involve an expert review panel. I consider proposed Condition

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[73] At paragraphs 11 to 13.

[74] This is reflected in the Appendix M.B of the draft Ecological Management Plan and proposed Conditions G.34(c), G.34(d) iii and viii, as well as G.38.

[75] See Annexure D.

[76] Williams EIC, paragraph 124.

G.40(c) addresses this matter sufficiently through the requirement for GWRC to be involved in adaptive management responses.

100 If related to Ms Myers' evidence, I do not agree with the recommended change in condition G.39 by KCDC's planner, Ms Thomson, which would require all monitoring carried out pursuant to the EMP to be "independently peer reviewed."

101 At paragraph 6.26, Ms Myers notes that the potential effects on the hydrology of wetlands should be incorporated at a very early stage as part of the overall ratio of wetland restoration required as part of the Project because of the potential significance and uncertainty of these effects. As discussed earlier in relation to Mr Porteous I disagree that mitigation should be required before an effect has been observed – particularly in the case of such complex hydrosystems as the fen and swamp wetlands involved.

102 Ms Myers goes on to state that mitigation for effects on the hydrology of wetlands can include alteration of hydrology through artificial structures and restoration of wetland habitats in adjacent areas to offset loss [paragraph 6.26]. I agree and a number of these options are identified in my assessment[77] and covered by proposed Condition G.40(c).

103 At paragraph 6.30, Ms Myers states that conditions need to specify a higher level of sediment control in the Te Harakeke/Kawakahia Wetland, and on the Waikanae Estuary, and that monitoring should be undertaken of downstream effects on the wetland. I agree and note that the baseline monitoring plan that has been developed[78] focuses on the Waikanae estuary and the streams that flow into the Te Harakeke/Kawakahia wetland.

Re-vegetation and mitigation planting

104 Ms Myers supports the integration of ecological planting with landscape planting under proposed Condition DC.54. However she considers that it is difficult to differentiate the exact details of the planting and states it is unclear how the proposed re-vegetation of terrestrial habitat undertaken as part of landscape planting will contribute to restoration and replanting of indigenous forest, wetland and shrubland communities representative of the diversity of forest and wetland types being lost [paragraphs 6.35 and 6.36].

105 I believe this is a somewhat academic and pointless argument. You cannot draw a line through an area of planting and say that to this side there will only be landscape benefit, and to the other only ecological benefit. The Project's team view is that all landscape planting of

[77] Refer section 11.4 of Technical Report 26.

[78] As required by proposed Conditions G.38(a) and G.40(a). I note that this baseline construction monitoring programme has been circulated to GWRC for approval and is discussed further in the rebuttal of **Dr Keesing**. Mr Ridley also addresses this additional level of protection in his EIC.

indigenous species will provide ecological benefit, and much of the planting required for ecological mitigation will provide landscape benefit. (See also paragraph 117 below.)

106 Nonetheless, we have ensured for clarity that all ecological mitigation areas are in discrete and clearly identified locations so that their long-term protection and management is assured. I have therefore clearly required that for each type of vegetation loss an appropriate quantum of mitigation planting be carried out. Proposed Condition G.42 ensures there are appropriate mechanisms in place to ensure this level of planting is undertaken, and proposed Conditions G.34(d) viii and ix ensure that mitigation requirements are undertaken and monitored to ensure success is achieved and monitored to confirm that mitigation meets objectives.

107 At paragraph 6.37, Ms Myers notes that as much of the mitigation for 'destruction' involves wetland restoration and the uncertainty of the impacts on hydrology, there is a need for a longer maintenance time period to monitor success. Ms Myers states best practice maintenance of revegetation plantings includes requiring canopy closure and a required success rate for plantings, citing the Auckland Council Rodney District Plan which requires 80% canopy closure and a survival rate of 90% of the original density and species.[79]

108 I agree with Ms Myers that these levels provide a good guideline. However, some areas of ecological planting include areas of open water and specific canopy closure requirements need to reflect this. As discussed by **Mr Evans** in relation to the maintenance and specifications for landscape planting in his rebuttal of Ms Julia Williams and Ms Thomson,[80] this matter would be better dealt with during the development of site specific planting and management plans for these areas. I recommend an amendment to proposed Condition G.42 to require the development of site specific ecological management plans (see **Annexure D**).

Impacts on Indigenous fauna and flora

109 Ms Myers recommends that a lizard management plan should be developed for the Project, to capture and move lizards within likely habitats, and that this should be specified in conditions.[81] I agree to the extent that such a Plan would relate only to the habitats outlined in my EIC [paragraph 136].[82] This can be suitably addressed by an amendment to Condition G.34(d) similar to that proposed by Ms Thomson. This is now shown in **Annexure D**.

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79 Myers evidence, paragraph 6.38.

80 Thomson evidence, para 9.27 in relation to her suggested amendments to proposed Condition DC.54 (d)(v).

81 Myers evidence, paragraph 6.42.

82 At paragraph 136, I recommend that prior to any construction in the vicinity of the El Rancho wetland, a series of tracks should be cut through the scrub within the Project footprint to allow the area to be searched for arboreal lizards.

110 Ms Myers also recommends that a specific condition should be included to specify avoidance of adverse effects on the *Korthalsella salicornioides* (dwarf mistletoe) populations within the alignment [paragraph 6.43]. I believe an additional condition is unnecessary. As outlined in paragraph 2.02 of my EIC, this population is located 100m from the edge of the Project footprint and the avoidance of this species is specifically addressed in the proposed Condition G.41(d) which requires maps and delineation of valued wetland vegetation and habitat to be protected.

Brydon Hughes for KCDC

111 Mr Hughes notes that the Expressway alignment passes close to several significant wetland areas which are potentially sensitive to small changes in groundwater level under both 'average' and 'extreme' conditions [paragraph 3.3]. Mr Hughes also notes that while extensive investigation and modelling has been undertaken to quantify potential effects arising from Expressway construction, due to the heterogeneity of the hydro-geological environment an element of uncertainty remains regarding the absolute magnitude of effects likely to result [paragraph 3.4]. I agree with this statement.

112 At paragraph 6.9, Mr Hughes notes that proposed Conditions GD.1 to GD.8 contained in the evidence of Ms Williams go some way to addressing issues related to the duration of monitoring and the potential for effects on wetland ecology. However, Mr Hughes still considers it necessary that provision be made in the Groundwater (Level) Management Plan (GLMP) for the hydrological characterisation of individual wetlands prior to construction and the automatic monitoring of groundwater level and/or stage height in or adjacent to high value wetland areas. Mr Hughes also recommends that provision be made for input from Council into the development and review of the monitoring program.

113 I have discussed this issue in paragraphs 72 to 78 in response to Mr Percy and Mr Callander for GWRC.

Robert van Bentum for KCDC

114 At paragraph 5.8, Mr van Bentum recommends that a specific consent condition be provided which requires that the final operational designation be created so that it fully incorporates the areas of offset storage, ecological offset and wetland treatment so as to ensure that these mitigation works continue to function on an on-going basis. As outlined in paragraph 119 below, I consider that this can be addressed by an amendment to proposed Condition G.43 which sets out the mitigation and maintenance requirements. (See **Annexure D**.)

115 At paragraphs 6.2 and 6.3, Mr van Bentum recommends that the Erosion and Sediment Control Plan be amended to include enhanced erosion and sediment control measures for, at a minimum, the following wetlands due to the serious impact of sediment on any aquatic life: El Rancho/Takamore Trust Wetland, Raumati Wetland

(between Poplar Avenue and Raumati Road), and the Otaihanga Wetland (adjacent to Otaihanga Landfill).

116 I agree with Mr van Bentum that including these specific wetland features would reduce risk to these ecosystems. I note that the rebuttal statement of **Mr Ridley** also agrees from an erosion and sediment control perspective, and Mr Ridley has recommended amendments to proposed Condition G.27(d) to ensure these wetlands are afforded particular attention.

Julia Williams for KCDC

117 At paragraph 10.7, Ms Julia Williams notes that she does not differentiate between the 'ecological' and 'landscape' mass plantings; in many cases the same species are used, and from a visual perspective the same outcomes are sought in the form of a self-sustaining plant community. While I agree with this statement, as discussed in my response to Ms Myers, the ecological mitigation areas are in discrete and clearly identified locations so that their long-term protection and management is assured.

Emily Thomson for KCDC

118 At paragraph 9.25, Ms Thomson recommends changes to proposed Condition DC.54 (as recommended by the evidence of Mr van Bentum and Ms Myers) as follows:

> The final operational designation area shall fully incorporate the areas of offset storage, ecological offset and wetland treatment (with the exception of offset storage area 6A) to ensure that these treatment and mitigation works will continue to function and be able to be maintained on an on-going basis by the consent holder.

119 I agree with Ms Thomson that a condition is appropriate to ensure that the ecological mitigation areas are incorporated in the designation and they are maintained in the long-term. I consider that this could be addressed through a specific amendment to proposed Condition G.43 which sets out the mitigation and maintenance requirements. (Refer **Annexure D**.)

120 Ms Thomson recommends amendments to proposed Condition DC.54(vi) (as recommended in the evidence of Ms Williams and Ms Myers), as follows [paragraph 9.27]:

> Coordination of landscape works with ecology works, including those required for stream diversion and permanent stormwater control ponds and how proposed ecological planting and landscape planting will be differentiated and managed;

121 As outlined in paragraphs 104 to 106, Mr Evans and I disagree that such differentiation is required as landscape planting of indigenous species will provide ecological benefit, and much of the planting required for ecological mitigation will provide landscape benefit (not to mention the water quality benefits). I consider that the mapping of

the ecological mitigation areas provides the differentiation from landscape areas, accepting that their management and maintenance may largely be the same. Most importantly, there are already appropriate conditions proposed that will ensure success is achieved and that require monitoring to confirm that ecological mitigation meets objectives (refer proposed Condition G.34(d) viii and ix).

122 Ms Thomson recommends changes to proposed Condition DC.57(f) (as recommended in the evidence of Ms Myers, Ms Williams and Mr Coombs), as follows:

> A maintenance regime including the control of pest animals (including possums, rabbits and hares) and pest plants, monitoring and reporting requirements, which is to apply for ~~two~~ five years (for terrestrial) and ~~four~~ five years (for wetland and riparian vegetation) following that planting being undertaken. A review period for the success of the plantings is to apply for 10 years following the planting being undertaken:

123 **Mr Evans** supports the specific control of these animal and pest plant species in his rebuttal statement and I am in agreement with him. Similarly, I agree with Mr Evans contention in his rebuttal statement that the maintenance periods specified are sufficient (i.e., 2 years and 4 years respectively). Mr Evans has addressed the 10 year review period in his rebuttal statement and I consider that this is addressed from an ecological perspective by proposed Conditions G.34 (d)(viii and ix).

124 At paragraph 10.3, Ms Thomson recommends an amendment to proposed Condition G.19 (as recommended in the evidence of Ms Myers), as follows:

> The management of key environmental effects associated with the construction phase of the project shall be detailed within the environmental management plans that are included in the appendices to the CEMP (draft plans were submitted with the applications). The finalised management plans shall be submitted to the Manager for certification at least 15 working days before the commencement of construction. Works shall not commence until the consent holder has received the Manager's written certification for the management plan(s). The CEMP shall identify how the management plans have been integrated with each other to manage effects including ecological effects.

125 I agree with Ms Thompson and Ms Myers. While I consider that this requirement is largely addressed by proposed Condition DC.54(d)(vi) (which requires that the LMP shall provide information on the coordination of landscape works with ecology works, including those required for stream diversion and permanent stormwater control ponds), I consider this amendment would provide the necessary certainty that the relevant plans have suitably considered the management of ecological effects. (Refer **Annexure D**.)

126 At paragraph 10.5, Ms Thomson recommended an amendment to proposed condition G.27(d) (as recommended in the evidence of Dr Death and Mr van Bentum), as follows:

> Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas, including El Rancho/Takamore Trust Wetland, Raumati Wetland (between Poplar Avenue and Raumati Road), and the Otaihanga Wetland (adjacent to Otaihanga Landfill).

127 I have addressed this in paragraph 116 earlier in my rebuttal and support the intention to reduce risk to these ecosystems by ensuring these wetlands are afforded particular attention. **Mr Ridley** has incorporated suggested changes in his rebuttal statement to proposed Condition G.27(d).

128 At paragraph 10.7, Ms Thomson recommends amendments to proposed Condition G.29 (as recommended in the evidence of Mr van Bentum and Ms Myers), as follows:

> The consent holder shall finalise, submit and implement through the CEMP, the Groundwater (Level) Management Plan (GMP) to be submitted to the Manager for certification at least 15 working days prior to works commencing. The purpose of the management plan is to address the minimum standards, outline the best practicable options for groundwater management and procedures to minimize the effects on groundwater levels.
>
> Base level monthly monitoring shall be undertaken commencing at least one year prior to construction commencing in order to set critical thresholds to trigger mitigation actions, and to design effective mitigation methodologies.
>
> The GMP shall be finalized in consultation with Te Ati Awa ki Whakarongotai and Takamore Trust.
>
> The G~~W~~MP shall include information regarding:
>
> i. the hydrological regime of each high-value wetland, including the standing water levels of wetlands prior to construction commencing;
>
> vi. monitoring frequency during construction and for at least 3 years following completion;
>
> x. response management; and
>
> xi. consistency with the EMP, particularly details of how hydrological effects on wetlands will be monitored and avoided; and
>
> xii. review procedures, including how input from KCDC will be incorporated into the monitoring programme.

129 This has been addressed by **Ms Williams'** EIC and rebuttal evidence.

130 At paragraph 10.11, Ms Thomson recommends amendments to proposed condition G.34(d) (as recommended in the evidence of Ms Myers and Dr Death), as follows (terrestrial only):

(d) The EMP shall provide information on how the following outcomes will be achieved:

i. Avoid and minimise loss of valued vegetation and habitats;

iii. Avoid and minimise effects on identified wetlands resulting from hydrological changes to water tables;

vi. Re-establish affected lizard habitat and minimize lizard mortality resulting from construction of the Project and include an indigenous lizard management plan for the Project …

131 As discussed earlier, I am comfortable with these additions, with the exception that a lizard management plan needs to be limited to the habitats identified in the assessment of effects. I have recommended changes to proposed Condition G.34(d)(vi) in Annexure D to address this.

132 At paragraph 10.13, Ms Thomson recommends amendments to proposed Condition G.38 (as recommended by Ms Myers) to collect information on vegetation and wetlands on a quarterly basis for 1 year prior to construction, during construction and for 2 years following construction. As discussed in the rebuttal statement of **Ms Williams**, groundwater monitoring should be trend monitoring and carried out annually and correlated to changes in piezometer levels. However, it may be appropriate as part of adaptive management to increase the frequency of sampling if statistically significant changes are recorded by the piezometers.

133 At paragraph 10.15, Ms Thomson recommends amendments to proposed Condition G.39(c) (as recommended by Ms Myers) to require all ecological monitoring to be independently peer reviewed. I am not in favour of adding additional layers into the compliance process given GWRC employs hydrologists, freshwater and wetland ecologists capable of assessing reports provided to them.

134 At paragraph 10.17, Ms Thomson recommends amendments to proposed Condition G.41 (as recommended by Ms Myers), as follows:

> In order to minimize the extent of effects on any area of natural vegetation and on habitats of indigenous flora and fauna located within the designation, the Consent Holder shall engage a suitably qualified ecologist to prepare detailed maps identifying all those areas listed in (c) and (d) below and other habitats not identified as high value, including areas of wetland, with information on their relative values and protection requirements and how these areas will be legally protected and (e.g. covenanted) in perpetuity. The maps shall be completed as part of detailed design and shall inform: …

135 I am generally comfortable with the proposed amendments to identify other areas of identified ecological value. However, I disagree with the additional requirement to outline how these areas will be legally protected in perpetuity and consider the protection of these areas is suitably addressed by my recommended amendments to proposed Condition G.43 in Annexure D.

136 At paragraph 10.19, Ms Thomson recommends amendments to proposed condition G.42 (on the recommendation of Ms Myers) to require at least double the area of revegetation currently proposed in order to mitigate the adverse effects on wetland and indigenous forest and shrubland ecosystem types. I disagree. There is no need or valid rationale for a doubling of mitigation. **Mr Fuller** will discuss this further in his rebuttal evidence.

137 At paragraph 10.20, Ms Thomson recommends amendments to proposed Condition G.43 (on the recommendation of Ms Myers), as follows:

> The mechanisms to achieve ongoing protection of the above mitigation areas shall be set out within the EMP and shall as a minimum cover:
>
> e) The control of deer, goats, pigs, ~~and~~ weeds, mustelids, rats, feral cats and possums to levels that are necessary to achieve the conditions imposed on the relevant designation and associated consents, and to prevent significant loss of existing natural values; ...

138 Ms Thomson does not provide justification for the control of these species as part of any targeted mitigation. It is my view that pest control should only be used where it is required to mitigate for a specific effect. **Dr Bull** discusses this in her rebuttal statement in relation to fernbird management.

OTHER SUBMITTERS' AND EXPERTS' EVIDENCE

Dr M.E. McIntyre for APSOC

139 Dr McIntyre notes that the Waikanae area is especially favourable (a 'hot-spot') for mosquitoes [paragraph 5] and that seasonal nuisance and potential disease threats will be exacerbated by presence of artificial standing water pools, as proposed to contain runoff from the Project. Dr McIntyre seeks a commitment that an independent resurvey of mosquitoes before construction should be undertaken to establish a baseline to enable later evaluation and implement appropriate ongoing control measures [paragraph 15].

140 I agree with Dr McIntyre that this is a potential risk for standing water ponds on the Kāpiti Coast. For this reason we provided feedback early in the Project shaping process to ensure that stormwater treatment wetlands and flood storage areas would be densely vegetated and avoid creation of large open areas of open water. The design of these is addressed by Mr Levy in 4.23 of Technical Report 22 (page 57) and in his rebuttal statement.

141 Ongoing management of these wetland areas will be required and I would be comfortable for this monitoring to include monitoring and associated control, if necessary, of mosquitoes during their breeding season.

Paula Warren for Ms Pomare

142 Ms Warren is critical that my assessment did not cover all "organism groups" including fungi, bryophytes, lichens and micro-invertebrates. Ms Warren is also concerned that I have not given due weight to the gaps in our knowledge or the history of habitat loss. I disagree. Technical Report 27 contains a section dealing with the history of loss and modification, and describes the historic vegetation.[83]

143 With regard to the organism groups Ms Warren describes, historical records and photography show that all of the proposed alignment has at one time or another been in improved farmland. Therefore any indigenous communities of flora and fauna that are present today have already re-established themselves following clearance. This suggests that any species currently present is robust and disperses well.

144 I have assumed that any rare or threatened indigenous species of bryophytes, lichen, moss or non-macro invertebrate will occur in predominantly indigenous habitats. These habitats have all been identified and, where possible, avoided. For those areas where avoidance has not been possible due to other constraints, there are few situations where an entire indigenous ecosystem will be lost (i.e. the entire area of wetland habitat). For a number of these areas where there is substantial loss of indigenous vegetation or habitat, I have recommended the transplanting of existing wetland plants as part of the wetland mitigation proposed. In addition to the large scale wetland and terrestrial planting along the proposed alignment, I believe there are good opportunities for these rare of threatened organisms to re-establish in similar areas of habitat.

145 Where these groups of organisms occur within pasture or urban environments along the proposed alignment, I have assumed that they are resilient, good dispersers, and locally common.

Christopher Horne for Ms Pomare

146 At paragraph 24, Mr Horne states that the construction, maintenance and operation of the proposed Kāpiti Expressway could cause permanent changes to the hydrology of the wetland forest at Ngā Manu Nature Reserve – and that this would be likely to cause plant die-back, permanently adversely affecting the composition of the forest.

147 On the basis of advice given to me by Ms Williams, I disagree that the Project could lead to permanent changes to Ngā Manu Nature reserve. At its closest point, this Reserve lies some 250m 'upstream' of the Project footprint, and is over 1km distant at its eastern margin.

148 Nonetheless, as outlined in my EIC,[84] as a precautionary approach, the Project proposes to monitor for potential changes in the vicinity of this important area of remnant swamp forest. If any changes occur, they

[83] Technical Report 27, sections 3.1, 3.5 and 3.7.

[84] Paragraph 133.

will be addressed via adaptive management techniques or other mitigation measures.

Jayne Staple for RSRA

149 Ms Staple notes that I disagree with the KCDC statement (in paragraph 23) that the Raumati Manuka Wetland is of regional ecological significance. Ms Staple states that to the RSRA the Raumati Manuka and Raumati Peatlands wetland areas are of high local significance [paragraph 13]. She also states the RSRA's support for the recognition of the importance of the 131 Raumati South Peatlands [paragraph 15].

150 My assessment of significance of these two wetlands took into account a number of relevant factors and I believe my conclusions remain valid. As I outline in response to Mr Porteous (in paragraphs 27 to 29 above), my assessment of medium significance for the Raumati Manuka Wetland did not influence the mitigation requirements, given that the entire Project designation lies within 'Acutely Threatened Land Environments' (Leathwick et al 2002; Walker et al 2007) where less than 10 percent of indigenous vegetation cover remains.[85]

151 In terms of the route selection process, the values of both these wetlands was particularly relevant to my assessment of effects as different alignment options affected each of these two wetlands in different ways. The original Western Link Road would have caused considerable loss of the 131 Raumati Peatlands. The current Project alignment, while still causing the loss of some vegetation (approximately 300m^2) on the margins of Raumati Manuka Wetland, will retain most of this wetland and will not impact on the 131 Raumati Peatlands. From an ecological point of view, the proposed alignment at this location has the least impact of the options considered – and importantly, the flood storage and mitigation proposed will enhance this area in the long-term.

Melanie Dixon for RSRA

152 At paragraph 32, Ms Dixon states her opinion that the Raumati South wetlands are of high ecological significance and should be considered to be regionally significant. Ms Dixon considers the loss of 300m^2 of the Raumati Manuka Wetland to be a moderate impact on a significant wetland. However, Ms Dixon agrees that the replanting proposed will help mitigate its loss and appropriate weed control will lessen the chances of weed establishment and invasion into the intact wetland [paragraph 36].

153 Ms Dixon states that there is not sufficient detail in the plans to assess how the operation of the flood storage area (OB) will affect the hydrological regime of the Raumati Manuka wetland [paragraph 46]. Mr Levy addresses this matter in his rebuttal. Ms Dixon goes on to state that rather than relying heavily on adaptive management with interventions, it would be better to first understand wetland's

[85] Refer Table 10 of Technical Report 27 [page 65].

hydrological regime and design the stormwater management accordingly.

154 To clarify, I assisted the hydrological team with input into the proposed location of the stormwater treatment wetlands and flood storage areas surrounding the Raumati Manuka Wetland and consider that this wetland's importance has been adequately considered in the design and location of these areas.[86] I agree that there is little known about the hydrology of this wetland - the intention of the monitoring and adaptive management programme proposed is to address these uncertainties. This is discussed in more detail earlier in my evidence (paragraph 56 above).

155 At paragraph 5.1, Ms Dixon recommends that a condition of consent should require the removal of all 'high priority weeds' from the designation, citing particular concerns regarding grey willow (*Salix cinerea*). I am comfortable with this recommendation, and like the many other weeds that require specific control, suggest it could be undertaken as part of the weed control proposed in the Landscape Management Plan under proposed Condition DC.57(e)(ii), as well as proposed Condition G.43(e) relating to the maintenance of ecological areas.

156 Ms Dixon supports the protection of the Raumati Manuka Wetland, but suggests further legal protection is warranted as was the outcome at Transmission Gully [paragraph 52].[87] I consider the retention of this wetland within the designation will provide sufficient certainty of protection (as outlined in my response to Ms Thomson above). However, as outlined in Annexure D, I support the amendment of proposed Condition G.43 to ensure that the ecological mitigation areas are incorporated in the designation and they are maintained in the long-term.

157 Ms Dixon seeks certainty regarding a 'wetland sensitive' design for cycleway/walkway [paragraph 62]. This is sensible and I suggest this could be addressed through an amendment to proposed Condition DC.57(h) which discusses the landscape treatment for walkways.[88]

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[86] Section 4.3.2 ii of Technical Report 22 clarifies that Wetland OA is located on the opposite side of the Expressway specifically to separate the wetlands so the Raumati Manuka Wetland does not receive run-off from the road. Section 4.3.2 iii states that this Flood storage offset area OB will be reinstated as a low lying wetland area planted with native species. It will be formed with localised depressions and low mounds to tie into and enhance the adjacent Raumati Manuka Wetland. It will not receive runoff from the Project.

[87] In the Transmission Gully Project, the majority of the mitigation areas lay outside the designation, on land acquired by NZTA as part of its land purchases. This raised the issue of the long-term protection of these sites which normally would normally be disposed under the Public Works Act. Special mechanisms for the protection of these areas were thus required. This is not the case for the Project where the great majority of mitigation falls within the designation.

[88] This is further addressed in **Mr Schofield's** rebuttal.

158 Ms Dixon seeks more certainty over hydrological monitoring and that the location and nature of mitigation planting be provided upfront rather than in management plans yet to be developed [paragraph 63]. I consider that the approach taken by the NZTA for consenting and planning is appropriate for a project of this scale and complexity; that is, the environmental outcomes are agreed and locked into conditions, and the delivery of those outcomes is then developed through management plans as part of detailed design process. I consider that the consultation required for the management planning process is sufficient and will ensure that the certainty Ms Dixon seeks is achieved.

159 Ms Dixon seeks recognition of the Raumati Residents Association Incorporated as a stakeholder to be consulted in the development of the relevant Management Plans where they relate to the Raumati South area [paragraph 64]. I am comfortable with this and suggest that this could be addressed through an amendment to proposed Condition DC.54(c).[89]

Richard Birkinshaw for Brent MacKay and Tordis Flath

160 In contrast to the submission of RSRA, Mr Birkinshaw at paragraph 4.2, states that an unreasonable weight is given to the protection of the 131 Raumati South Peatlands in deference to residents and families. Mr Birkinshaw states that the ecological value of the wetland area which would be affected by the rejected Poplar Avenue interchange options would appear to be given a higher socio / economic value than the disruption of families. Mr Birkinshaw states that this thinking is inappropriate and that there would be many local residents unaware that the wetlands even exist.

161 The decision to locate the proposed alignment in its current location in this area of Raumati South was made on the basis of a number of factors, of which wetland value was one. No comparison of ecological value was made with social or other factors: that is not the purpose of the MCA process.

162 However, I acknowledge (as discussed above) that the value of the 131 Raumati South Peatlands was an important factor in this decision. This wetland complex comprises 11.1 ha of very high quality fen wetlands which provide habitat for a number of naturally uncommon plant species.[90] The existence of these wetlands is well known, through being scheduled in the Kāpiti Coast District Plan (K131) and other wetland inventories. I consider the ecological importance of this wetland was not inflated by myself nor given unreasonable or excessive consideration as part of input into the Multi Criteria Assessment process. This is discussed further in the rebuttal evidence of **Mr Schofield** and **Dr Bentley**.

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89 Ibid.

90 Refer Appendix 27.1 of Technical Report 27.

Evidence of Helen Rutter for Christopher and Monica Dearden

163 Ms Rutter discussed potential hydrological changes on the modified ponds on the Tocker Property as a result of the Project and associated flood storage areas proposed in this area.

164 I did not consider these ponds to have ecological value in my assessment and I have not addressed this statement.

Beth Lindsay for Highway Occupants Group

165 At para 3.1, Ms Lindsay states that my assessment and the MCA did not adequately take into account the environmental implications of "destroying" the 28 properties required for the construction of the proposed Southern Entrance to the MacKays to Peka Peka expressway. Ms Lindsay also states that I dismiss the ecological value of trees, shrubs, bushes, flowers and flaxes, birds and wildlife on the properties to be destroyed at the Southern Entrance on the grounds that they are not "indigenous". Ms Lindsay states that in stark contrast, the vacant land for Option 2A, the designated route, is covered mainly with gorse and some regenerating kanuka scrub [paragraph 3.5].

166 I disagree. As outlined in paragraph 233 of my EIC, I visited a number of the properties with landowners at the Southern area of the Project, as well as undertaking numerous ecological investigations of the 131 Raumati South Peatlands within the Option 2A route. The vegetation referred to by Ms Lindsay was mapped and assessed accordingly.

167 I agree that the presence of this large wetland, which included a number of locally uncommon indigenous plant species, was an important factor in my assessment of alignment options within this southern portion of the Project.

Hariata Higgot

168 Mr Higgot notes that habitat for the "rare fern" (*Ophioglosum petilatum*) could be exterminated due to the loss of wetland at Weggery/El Rancho [page 7]. I disagree.

169 As outlined in Appendix 27.F of Technical Report 27, despite being found in 1981 in one of the wider El Rancho wetlands, this species has not been observed since.

170 Of the wider El Rancho wetland complex which has a combined area of 6.4 ha, 0.38 ha of the eastern fringe of one wetland area (El Rancho Weggery) will be lost under the Project footprint. Based on my analysis of high-resolution historical aerial photos and discussions with ecologists involved in the Western Link Road project, this area was wet pasture less than a decade ago and manuka has expanded onto it from the core wetland to the west. This wetland fringe has been extensively surveyed for this and other rare or uncommon plant species without result.

171 Even with the loss of this wetland fringe, the majority of El Rancho Wetland (Weggery) Wetland and the other surrounding wetlands that

form part of the wetland complex, will continue to provide habitat for any rare or uncommon species that are present.[91]

CONCLUSION

172 Overall, I consider my assessment of the ecological effects of the Project on terrestrial and wetland habitats is consistent with best practice, and that the mitigation requirements outlined are appropriate for the potential effects.

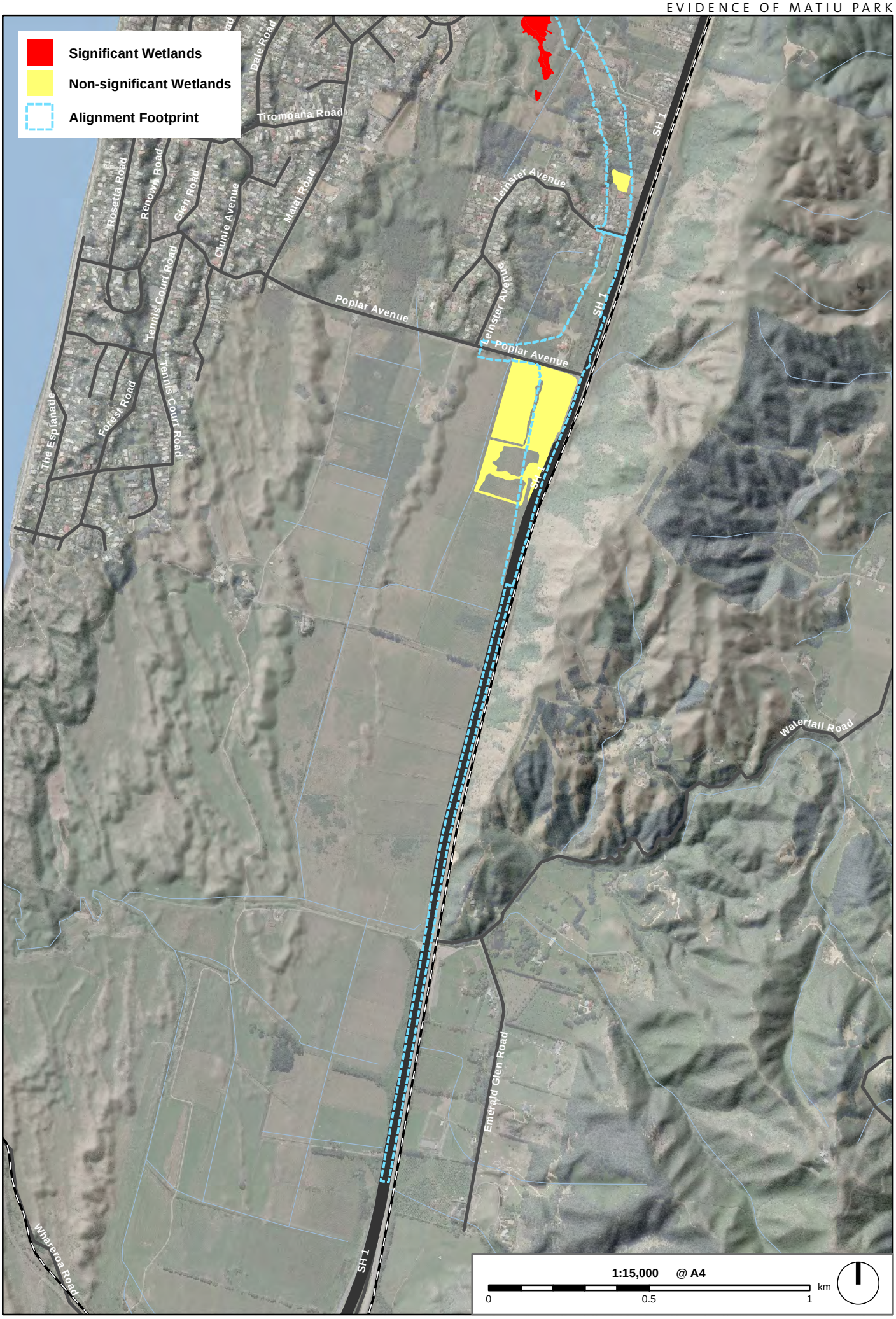
173 Like the other ecology, groundwater and hydrology experts, I acknowledge that uncertainty remains regarding the potential scale and magnitude of effects in some areas, particularly in relation to wetland hydrology. However, I consider that the monitoring and adaptive management approach I have outlined in my assessment, related reports and proposed consent conditions, suitably acknowledge and address this risk.

174 I propose a number of amendments to consent conditions to ensure an additional role for consent authorities in the adaptive management process and determining potential associated consenting requirements.

Matiu Park
26 October 2012

[91] Ms Higgot's evidence also cites a number of references to GWRC and KCDC submissions and Key Issues Reports that I have addressed in my EIC.

ANNEXURE A – MAP OF NON-SIGNIFICANT/SIGNIFICANT WETLANDS



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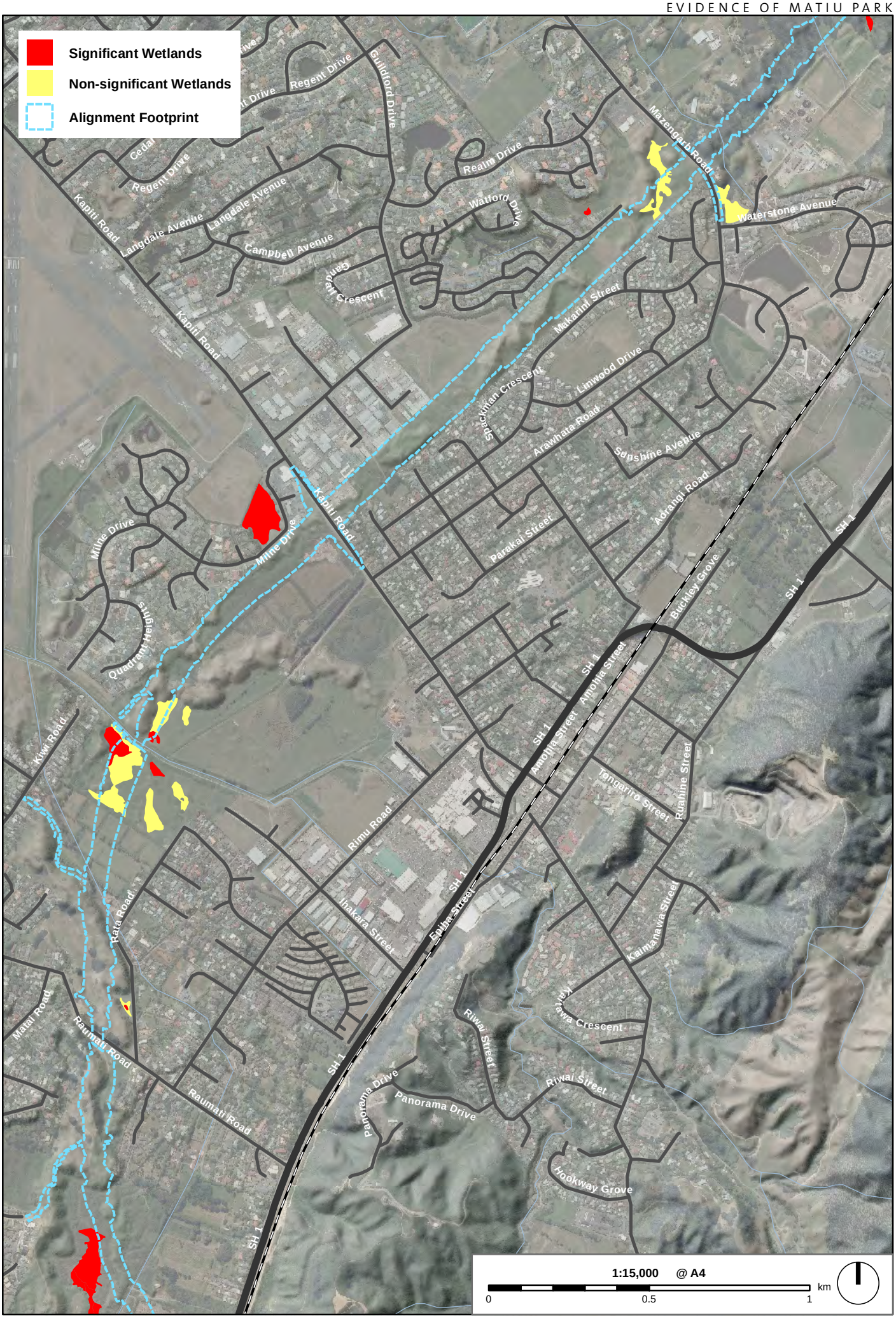


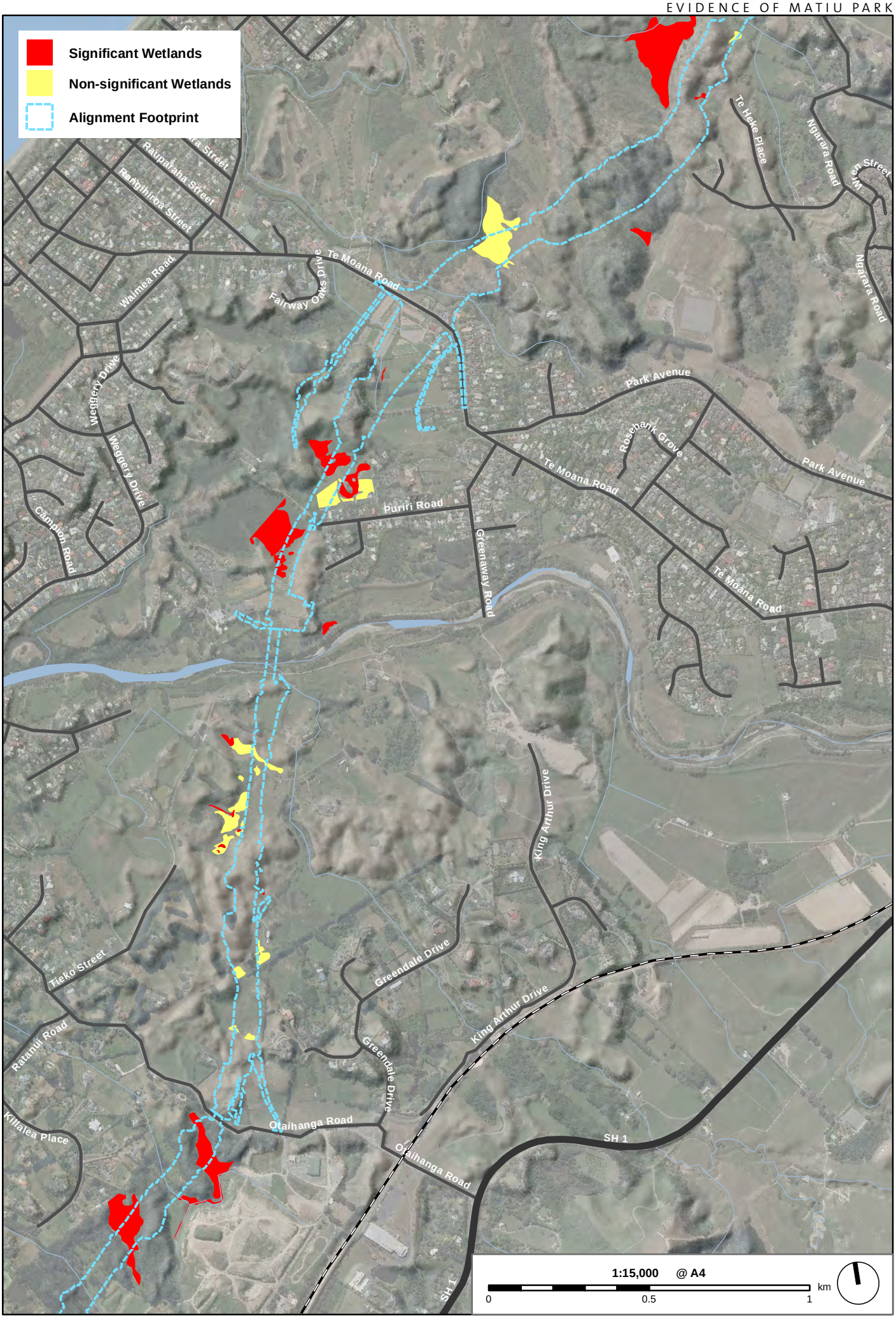
October 11, 2012 W09181E_EVI_SignificantWetlands_A4mb.mxd

NZ TRANSPORT AGENCY WAKA KOTAHI

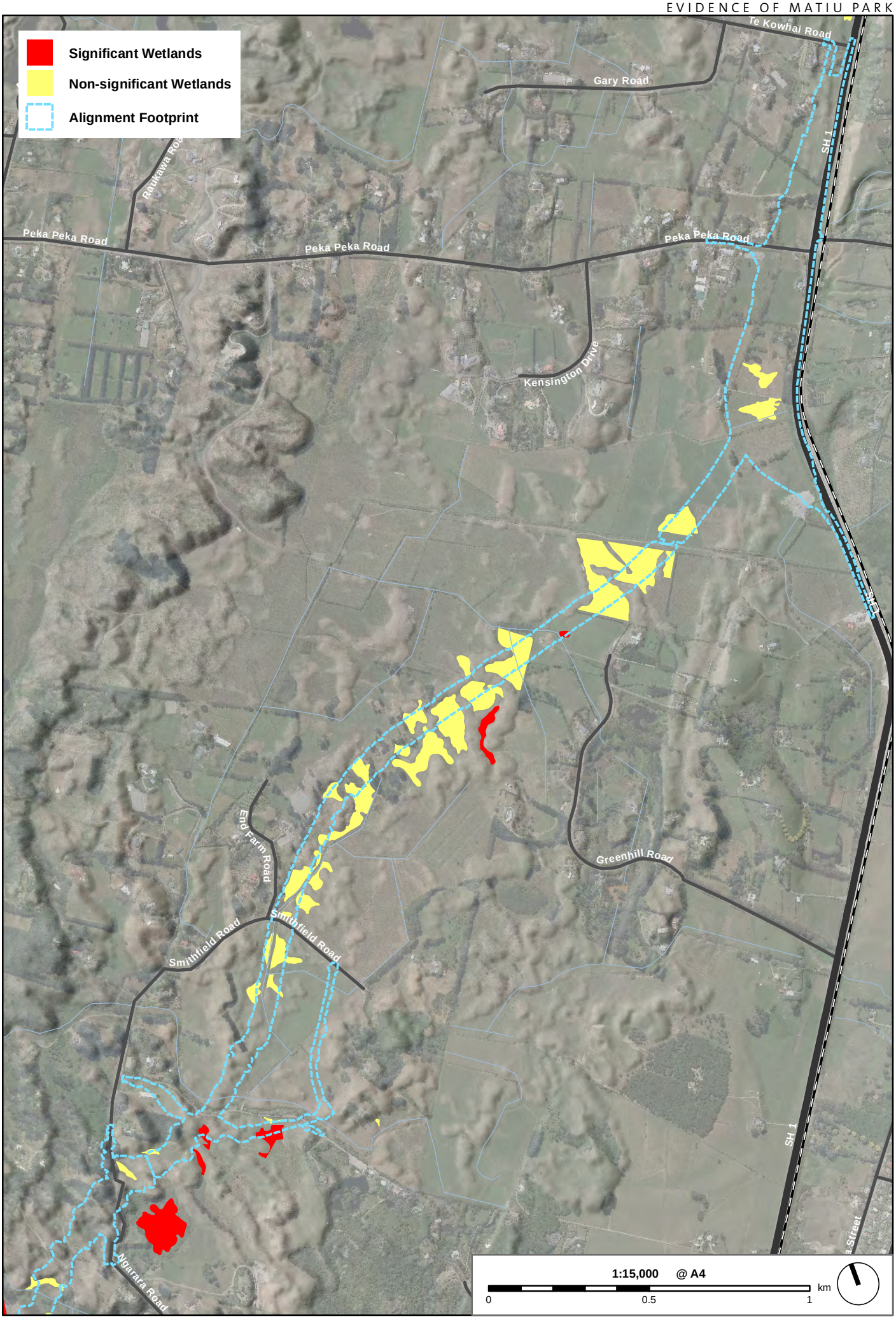
Mackays to Peka Peka

SIGNIFICANT WETLANDS

1b



October 11, 2012 W09181E_EVI_SignificantWetlands_A4mb.mxd



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NZ TRANSPORT AGENCY WAKA KOTAHI

Mackays to Peka Peka

SIGNIFICANT WETLANDS

1 d

ANNEXURE B – PHOTOGRAPHS OF NON-SIGNIFICANT WETLANDS

Photo above of Ngarara Dune Depressions (GWRC Name: 'Unsurveyed Site 5') identified by GWRC as significant.

Photo above illustrating area of Ngarara Road Wetland A (GWRC name) located within Project Footprint (foreground) identified by GWRC as significant.

Photo above illustrating the blackberry weedlands dominated portion of Ngarara Wetland (GWRC name: 'Ngarara Road Wetland D') identified as significant by GWRC (shed on Ngarara Road visible).

Photo above illustrating the Otaihanga Middle Wetland (GWRC name: 'Otaihanga Landfill Central') identified as significant by GWRC.

ANNEXURE C – A GUIDE TO IDENTIFYING WETLANDS IN THE WELLINGTON REGION (DRAFT AS AT SEPTEMBER 2006), GWRC

greater WELLINGTON
REGIONAL COUNCIL

A guide to identifying wetlands in the Wellington region

Draft as at 20 September 2006

Melanie Dixon

FOR FURTHER INFORMATION

Greater Wellington
Regional Council
Wellington
PO Box 11646

T 04 384 5708
F 04 385 6960
W www.gw.govt.nz

Greater Wellington
Regional Council
Upper Hutt
PO Box 40847

T 04 526 4133
F 04 526 4171
W www.gw.govt.nz

Greater Wellington
Regional Council
Masterton
PO Box 41

T 06 378 2484
F 06 378 2146
W www.gw.govt.nz

GW-EP-G-06/200

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Contents

Introduction

Wetlands are important because of the rich biodiversity – birds, fish, plants and insects – they support. But many wetland species have become increasingly rare as wetland habitat has disappeared. Wetlands also help protect against flooding, and store and purify water.

Hungry for pasture, settlers started draining the region's wetlands in the mid 1800s, a practice that continued until the 1980s. Many remaining wetlands are very small – half of them just two hectares or less.

Protecting and restoring our region's remaining wetlands depends on our ability to identify and manage these high value areas in the landscape. This guide will help anyone who is interested in identifying wetlands, especially if there is a dispute about whether an area is a wetland or not. Strong plant identification skills will, however, be needed to complete the Wetland Identification Form.

(add picture of people working in a wetland)

1. What are wetlands?

1.1 Wetland definition

Wetlands are defined in the Resource Management Act (1991) as *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.*

All wetlands have…..	
an abundance of water	Water creates wetlands. The water may come from a rainfall, a nearby stream, from groundwater seeping into the wetland or from the incoming tide. If this water saturates the soil for long enough, it causes chemical and physical changes to the soil. Wetlands do not need to be wet all year round – many wetlands in the Wellington region dry up over summer. Nor do they need to have areas of open water – most wetlands in the region are areas of saturated soils.
oxygen-poor soils	Wetland soils are different…When soil becomes saturated, the air between soil particles is replaced by water, forming a barrier that stops further oxygen getting into the soil. As soil organisms use up the dissolved oxygen initially present in the water, oxygen cannot be replaced and the soil becomes anoxic (completely depleted of oxygen.) Peat is the most famous of wetland soils. Peat is the build up of wetland plant material that has not been able to decompose in the wet conditions.
plants adapted to growing in the wet	The wetland environment is a harsh and stressful one. Plants that live in wet soils must adapt to the wet conditions and most importantly a lack of oxygen. Reeds and sedges have hollow structures that enable oxygen to travel quickly through the plant down to their roots. The swamp forest tree pukatea has knobs or 'knees' of root material that emerge from the wet soil that absorb oxygen. Some plants, like manuka are hardy generalists that can grow in wetlands and non-wetland areas. Other plants, like lake club rush are wetland specialists – they only grow in wetlands.

1.2 The wetland database

Most wetlands in the Wellington region have already been identified and information can be found about them in a database held in Greater Wellington's Geographic Information System (see V:\wreggis\NATURAL\wetlands). However, in the last few years Greater Wellington staff have found several large and significant wetlands that have never been included in ecological reports or surveyed by wetland experts.

If the area in question is not listed on the database, or you have doubts about the accuracy of some data in the database, this guide will help you decide if it is, or could be, a wetland.

1.3 Most wetlands are easily identified

Wetlands are a half-way-world between terrestrial (dry) and aquatic (deep-water) systems and exhibit some properties of both.

Most wetlands are easy to identify. However, some wetlands are difficult to identify and sometimes in these cases you will need to utilise someone with wetland plant identification skills to fill out the *Wetland Identification Form* (Appendix 1) and make a wetland determination.

1.4 What you need to take into the field

To help you identify wetlands it's useful to have the following:

- a camera
- plastic bags and marker pens (in case you need to bring any plants back for identification)
- a map or aerial photograph (scale 1:50,000 or closer)
- these guidelines.

2. What makes wetlands?

All wetlands, from salt marsh to alpine tarns and flax swamps have these features in common:

i. Hydrology: An abundance of water, either at the surface or within the root zone
ii. Hydric soils: Soils that are unique and differ from non-wetlands
iii. Wetland plants: Plants that are adapted to wet conditions.

Wetlands also support animals, but these are often secretive and difficult to find. In this guide we look at the three features above.

2.1 Wetland plants

Plants that dominate wetlands are adapted to growing in saturated soils. Some species are generalists and adapt readily to a wide range of conditions. Other plants are specialists and thrive only in a very specific habitat. Wetland specialists are better indicators of wetlands conditions than generalist plants.

Wetland scientists divide plants into different groups depending on the frequency with which they occur in wetlands (see Appendix 2), from specialists that rarely occur outside of wetlands, to terrestrial plants that are seldom, if ever, found growing in wetlands.

To complete out the *Wetland Identification Form* (Appendix 1) you need to be able to identify the dominant wetland plants and add up the different proportions of different species. This step, however, is rarely necessary. The photographs and information in this guide should help you to identify common wetland types in the region.

2.2 Where are wetlands found?

Wetlands are usually found in low-lying areas where were water persists. The water can come from rainfall, streams, regular or irregular flooding, groundwater or from the incoming tide. Climate, landscape position, frequency of flooding, and soil type all influence wetland formation.

Expect to find wetlands:

- in low lying areas with a very high water table
- in valley flats or depressions where impervious soil layers create a ‘perched water table’
- near rivers and streams
- on slopes where groundwater breaks out as springs or streams
- in broad river valleys with abandoned stream channels.

2.3 Wetland hydrology is difficult to assess on site

The amount of surface water and groundwater, and its movement, can be difficult to assess on site. Not every bit of wet ground is a necessarily wetland. For example, in wet periods water can lie on paddocks in areas that are not wetlands. On the other hand wetlands can dry out completely. Periodic “drying out” is a normal feature of a number of wetlands.

There is no exact measurement of how ‘wet’ a piece of land needs to be to be a wetland - w*etlands do not need to be wet for the whole year*. Some can, and do, dry up in summer. And just to complicate things more wetlands don’t need standing water, as long as *the root zone is saturated.* A large number of wetlands in the Wellington region do not have any open water, but do have saturated soils for most of the year.

2.4 Wetland soils

In wetlands, oxygen-starved soils, known as hydric soils can develop. There are two major types of wetland soils, organic and mineral.

i. **Organic soils** develop in areas where the water level is stable water (either just above or just below the surface) and the remains of dead plants cannot completely rot away. This constant saturation and consequent lack of oxygen means the plant material accumulates as peat. The peat in organic soils colours them black or dark brown.

Peat overlaying sand at Queen Elizabeth Park (summer 02/03)

ii. **Mineral soils** develop when the soil is only periodically saturated and contain few decomposing plants (i.e. organic material). Mineral soils contain more clay, sand, or silt and are often grey and may be mottled.

Mineral hydric soil Taupo Swamp (summer 02/03)

Not all hydric soils support wetlands. Most of the hydric soils in the Wellington Region have been drained to create pasture and no longer support wetlands.

3. When is wet land not wetland?

3.1 Wet pasture, and pasture with patches of rushes

Wet pastures, including pasture that supports patches of rushes (*Juncus* spp.) are not considered to be wetlands. Nor is an area with temporarily ponded rainfall.

However, these areas may have potential, if enhanced, to improve water quality filtering, soil conservation or biodiversity values. They are often former wetland areas that have been converted into pasture for agriculture.

Wet pasture with rushes (*Juncus* spp)

3.2 Artificial water bodies

The following artificial water bodies are not considered to be wetlands:

- artificial ponds used for wastewater or stormwater treatment, including those that have been constructed to look and function like natural wetlands
- artificial farm dams and detention dams
- land drainage canals and drains
- artificial reservoirs for firefighting, domestic or municipal water supply.

In addition, wetlands may be intentionally created (often for wildlife) or accidentally formed by undersized road culverts, etc. Over several years these areas may become valuable wetland sites. *In general, however, these newly created wet areas cannot be considered 'wetlands'* that meet the RMA definition.

Newly created water bodies at Battle Hill Regional Park, 2003

4. When is it difficult to identify wetlands?

4.1 Partly drained wetlands

Wetlands can be drained by drainage ditches, tile drains, groundwater takes, regulated riverflows, surface water diversions and similar actives. *Note that one drain is usually not sufficient to drain a large wetland* (and convert it to a non-wetland).

4.2 Forest and scrub dominated wetlands

A number of trees and shrubs grow in wetlands (for example, kahikatea, swamp maire, manuka and swamp coprosma). At first glance these may look like dryland forest or scrub, but a casual walk through is often enough to confirm whether it is a wetland.

Forest and scrub wetlands will have some or all of the following features:

- saturated soils and/or leads of open water under the vegetation
- evidence of recent flooding (water marks on trees etc)
- common wetland plants (such as sedges) in the undergrowth
- buttress roots on trees (kahikatea) which help stabilise the tree in wet soils
- aerial roots (pukatea, swamp maire) that help the tree get oxygen in wet soils.

See 5.1 for photographs of forest and scrub dominated wetlands

4.3 Ephemeral wetlands

Ephemeral wetlands are not permanently wet and occur where surface depressions pond water in wet seasons or wet years. The water that feeds ephemeral wetlands comes from localised surface runoff and/or groundwater, not from streams. They have significant fluctuations in water levels compared to other wetland types. The majority of ephemeral wetlands in the Wellington region are associated with sand dune landscapes, occurring in depressions between dunes (e.g. Queen Elizabeth Park), or on the margins of lakes (e.g. Lake Wairarapa).

A characteristic of ephemeral wetlands is the distinctive plant 'turf communities' they support. Turf communities are small plants (less than 3 cm tall) that grow in a tight, interlaced fashion. Unusually, native turf plants in New Zealand are annual, only growing when water levels drop. Turf communities are remarkably diverse and contain several threatened plant species.

Ephemeral wetlands are particularly difficult wetlands to identify in the field. If you suspect the wetland is ephemeral, then assess it after a sustained period (a week or so) of rainfall (usually during winter). Pools of standing water in combination with the presence of short turf plants (e.g. *Schoenus conccinus*, *Myriophyllum votschii*, *Pratia perpusilla* and *Glossostigma* species) would help identify the area as an ephemeral wetland.

Ephemeral turf species are growing in the foreground of this photograph (photo courtesy of Bev Clarkson, NIWA). In winter this area is underwater.

4.4 Wetlands with non-native plant species

A number of wetlands in the Wellington region are dominated by non-native wetland plant species (for example, crack willow over-topping sedges). Often these areas are considered wetlands despite being dominated by non-native plants – it depends on what species are present, and whether they are wetland specialists or otherwise.

5. Common wetland types in the Wellington region

New Zealand has a remarkable diversity of wetland types and many are found in our region. Most of our wetlands do not have areas of open water – they are thickly vegetated areas of saturated soils. In this section we've described common wetland types and you'll see they do not usually have open water present all year round.

5.1 Forest and scrub wetlands

Areas of swamp forest and wet scrubland are often not recognised as wetlands – but they are our most precious. For example, over 98% of kahikatea swamp forest has been lost nationwide and scrub wetlands are the main habitat for some of our rare wetland birds (for example, fern bird). If you can, walk amongst these areas. Are the soils saturated? Can you recognise any common wetland plants in the understorey? Dig a 30cm deep hole and see if fills quickly with water. Very little swamp forest remains, but there are pockets in the Wairarapa Valley and on the Kapiti Coast. Scrub wetlands are common in Upper Hutt (especially in the Mangaroa and Whiteman's Valleys) and between dunes on the Kapiti Coast.

Swamp coprosma and twiggy tree daisy (pictured) dominate this wetland in Wainuiomata.

Kahikatea and swamp maire swamp forest. Wetland has developed in the low point between sand dunes on the Kapiti Coast.

Kahikatea swamp forest with scattered cabbage trees. Wairarapa

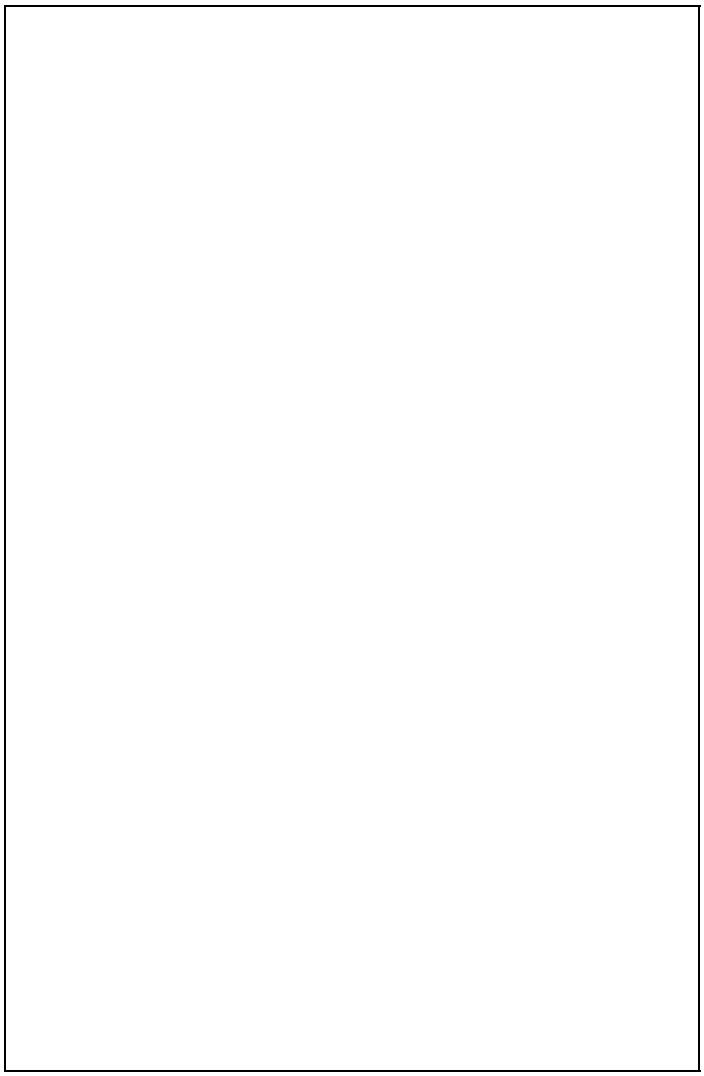
A manuka dominated wetland surrounded by a forestry plantation, north of Masterton. The emergent trees in the wetland are kahikatea.

5.2 Flax, raupo and *Carex* swamps

These areas are usually wetter and more fertile than the scrub and forest wetlands. Key species in theses wetlands include flax, raupo and *Carex*.

Flaxland

Flax swamps once supported a thriving industry in the region. Notable flax wetlands include Taupo Swamp in Plimmerton and the Waingawa Swamp in Masterton but there are several other flax wetlands in the region.

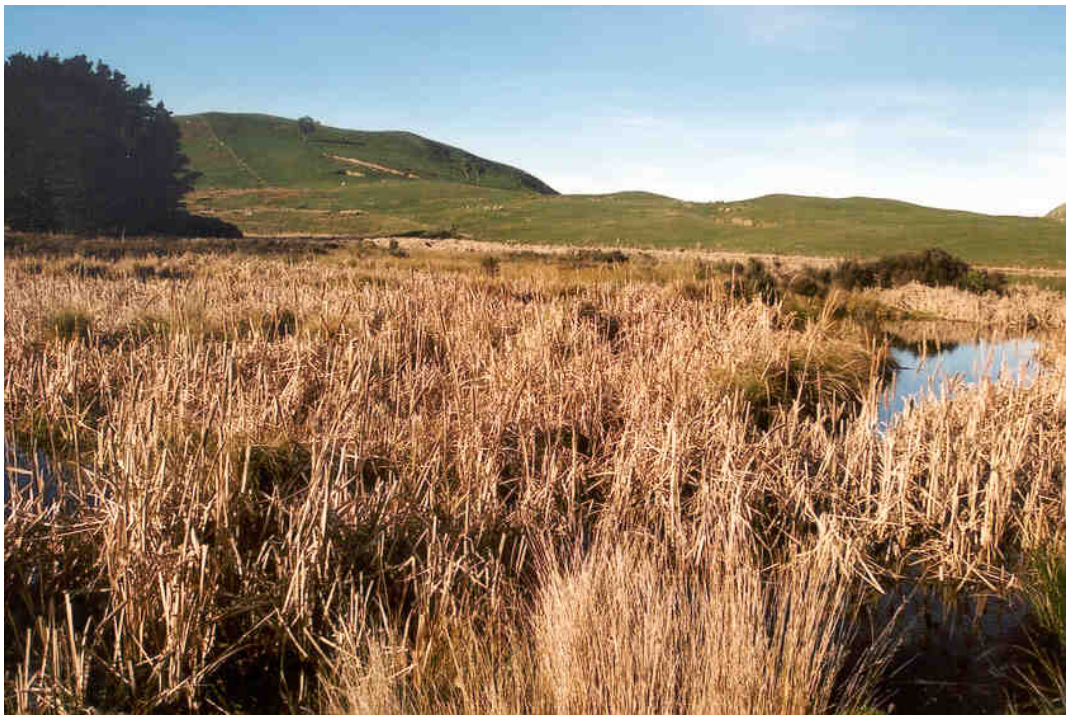


Flax is an important component of many wetlands in the region

Flax is one of many species in this diverse Kapiti Coast wetland. Other species visible in this photo include swamp coprosma, toetoe and cabbage trees (photo courtesy of John Preece).

Raupo reedland

Another key species in fertile swamps is raupo (bulrush). Raupo dies back over winter and grows again in the spring from starch filled rhizomes (underground stems). It often dominates large areas of wetland. A good example is McKay's crossing wetland on the Kapiti Coast. Raupo dominated wetlands are also very common on farmland.



A Wairarapa raupo reedland photographed in winter (note raupo dies back in winter and regenerates in spring from underground rhizomes)

A close up of a raupo reedland in summer

Carex sedgeland

Carex is a large genus of grassy looking sedges that are sometimes referred to as cutty grasses because of their sharp leaf edges. They are very common throughout the Wellington region, especially in fertile lowland swamps.

Carex sedges either grow as tufts or in swards, the former usually spreading by seed and the latter by underground stems called rhizomes. They have seeds that can persist for long periods in the seedbank; from months to decades depending on the species.

Carex secta (also known as purei, or pukio) is widespread in the Wellington region

Rautahi, a sward form *Carex,* is growing n the foreground of this photograph of a wetland near Lake Wairarapa. Cabbage trees and swamp coprosma are growing in the background

A wetland purei (*Carex spp.)* sedgeland in the Wairarapa.

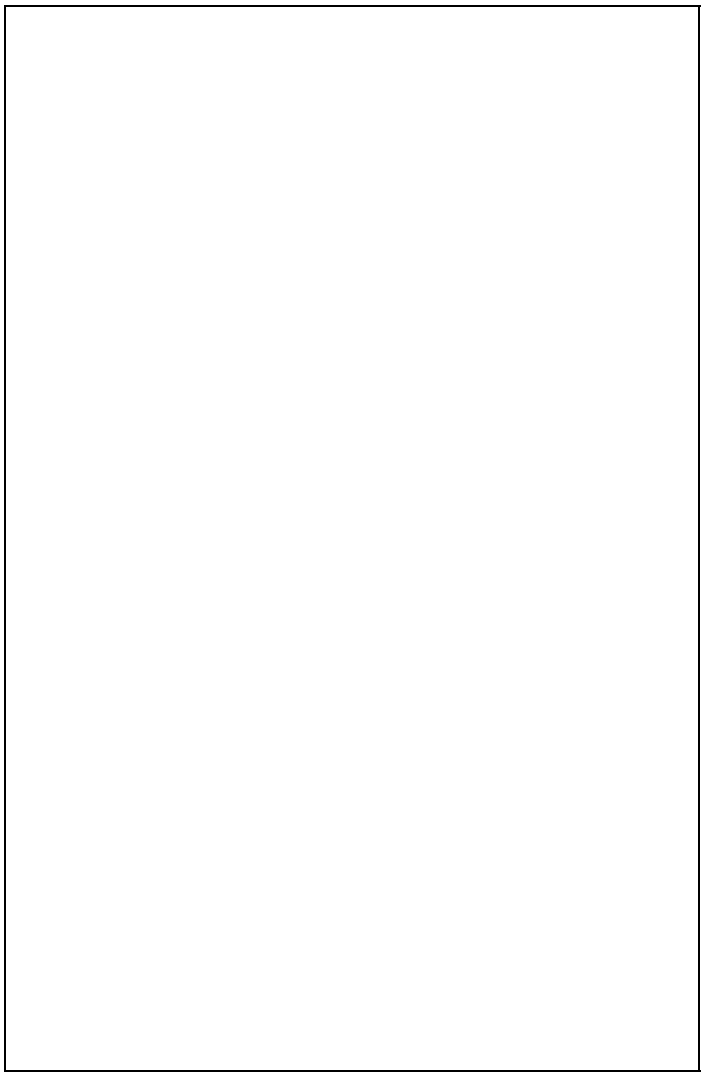
5.3 Ephemeral wetlands

Ephemeral wetlands are difficult to identify. They are areas which have pools of open water during winter and spring but these dry out over summer. As the pools dry out they are filled with tiny annual 'turf' plants, many of which are rare species. Ephemeral wetland areas can be found adjacent to Lake Wairarapa and in Queen Elizabeth Regional Park in Paekakariki.

Ephemeral turf plants are growing in the foreground of this photograph taken during a dry summer. In winter this area is normally underwater. (Photo courtesy of Bev Clarkson, NIWA)

5.4 Rushes

If rushes (plants in the *Juncus* group, either called rushes or wiwi) and pasture grasses are the only plants present it's more likely that you have an area of boggy paddock, rather than a wetland. But if you are in doubt, contact Greater Wellington to check it out. These are often great areas to re-create wetlands.

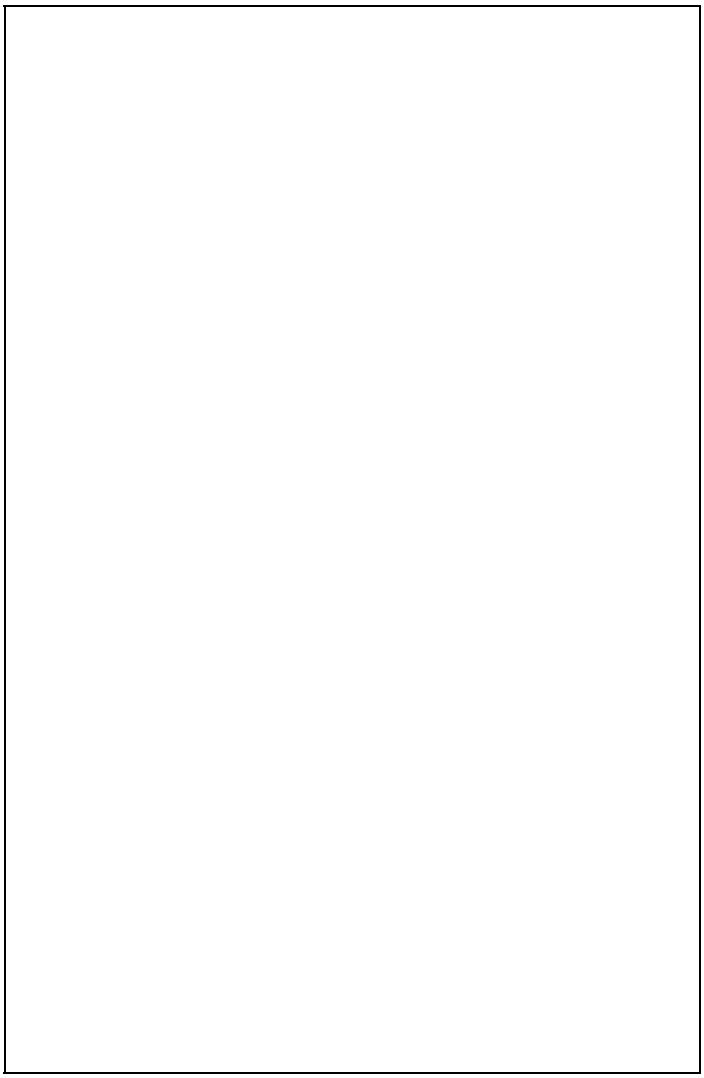


The large rush, *Juncus procerus*, growing at Queen Elizabeth Park. This *Juncus* is native to the northern hemisphere and considered a weed.

5.5 Saltmarsh

So far we've talked about freshwater wetlands, but salt water wetlands are also important. Our region's too cold to support mangroves but we do have areas of saltmarsh dominated by sea rush (*Juncus kraussii*) and oioi (*Apodasmia similis*). The biggest area of saltmarsh is in the Pauatahanui Inlet, but small patches of saltmarsh also occur at the mouths of small streams and rivers throughout the region.

Areas of salt marsh, such is this area here near Lake Wairarapa, are important for whitebait spawning.



The salt tolerant oioi growing at Pauatahanui. The colour of oioi varies and sometimes looks orange, brown, or even purplish.

6. Why do we have wetland rules?

Wetlands play an important part role in cleansing and storing water. Looking after wetlands also helps mitigate climate change – if they dry up they release all of their stored carbon. Healthy wetlands are a 'sink' for excess carbon – unhealthy wetlands are a 'source'. Global climate change is a very topical issue and it's reassuring to know that if we manage our wetlands well we're doing our bit to help limit the adverse effects of climate change.

A big step forward in managing wetlands is knowing how to recognise one. It's not always easy being able to spot the difference between a piece of boggy paddock and a rich ecological resource. It's important to know the difference, because then we can be sure we're protecting these precious areas. To help protect wetlands on private land there are some rules – and landowners need to know what these rules are about.

Check with your Greater Wellington Regional Council before doing anything that might damage a wetland

In general, anything that will alter water levels in a wetland or lake (including constructing new drains, or damming water either in, or near a wetland), and in most cases activities that disturb the bed of a wetland (such as earthworks in a wetland) require a resource consent under Greater Wellington's Regional Freshwater Plan.

Even if you are planning to 'enhance' your wetland to attract waterfowl by creating open water you still need to check with Greater Wellington to see if you need a resource consent. You can read the regional rules www.gw.govt.nz/regionalrules or contact the Consents Help Desk in Wellington on 04 384 5708 or in Masterton on 06 378 2484.

Your local district or city council may also require a consent if you are planning earthworks or vegetation clearance in a wetland, so you need to check with them as well.

6.1 Interested in wetland restoration?

There is plenty of assistance available for people who want to look after wetlands. The wetland pages on Greater Wellington's website is a great place to start (www.gw.govt.nz/wetlands). All landowners with a natural wetland on their property qualify for help with fencing and weed control.

Appendix 1: Wetland Identification Form

Table 1: General site information

Date:	Assessor(s):
Grid Reference:	Address:
Landowner:	Have you taken photographs? YES / NO
Any signs of human modification (detail):	
Has the area been identified as a wetland before?: YES / NO Source:	
Have you attached a map of the area?: YES / NO Approximate size of area assessed:	

Table 2: Plants

Species	% cover	Indicator Status				Native? (tick)
		OBL	FACW	FAC	TER	
TREES[1]						
1.						
2.						
3.						
SHRUBS						
1.						
2.						
3.						
GROUND COVER						
1.						
2.						
3.						
4.						
5.						
TOTAL						

Total area OBL + FACW plants = _____

Total area TER = _____

(OBL + FACW) – (TER) = _____*

* If this number is positive than the area can be considered a wetland.

[1] Note: only a limited number of spaces are provided as only the dominant plants should be listed. Only include plants which have the highest cover percentages (generally over 20%) in any vegetation layer.

Table 3: Additional comments

Further vegetation comments: (e.g. any rare or special plants?):
Hydrology comments: (Depth of surface water, depth to free water in pit, depth to saturated soil, possible association with rivers, streams, or lakes.)
Recent weather patterns (if known):
Soils comments:

Table 4: Wetland determination

Summary: Is the area a wetland? YES / NO Supporting Comments:

Appendix 2. Plant indicator status

1. Plant Indicator Status categories used in wetland delineation

Plant Indicator Status Categories used in wetland delineation	
Obligate wetland plants (OBL) & Aquatic plant species (AQU)	Plants that occur almost always (>99%) in wetlands under natural conditions, but which may also occur rarely (~1%) in non-wetlands. Examples: bamboo spike sedge, raupo This group also includes Aquatic plant species (AQU) which are always found either submerged under, or floating on more-or-less permanent water. Examples: blunt pondweed, duckweed
Facultative wetland species (FACW):	Plants that occur usually (67-99%) in wetlands, but also occur (1-33%) in non-wetlands. Examples: oioi, flax
Facultative species (FAC):	Plants that have an equally likelihood of occurring in wetlands or non-wetlands. These plants are real generalists and are not reliable indicators of wetlands. An example is manuka that grow in wetlands and on the steepest driest slopes. Several weeds also fit into this category. Examples: pukatea, shore lobelia, gorse
Terrestrial plants (TER):	Plants that rarely occur in wetlands. Examples: kamahi, ponga.
Riparian plants (RIP):	Plants that typically occur on the banks of streams etc., but are not necessarily tolerant of wetland conditions Examples: kowhai, lowland ribbonwood.

Identifying the boundaries of wetlands

The margins of a wetland are delineated by a transition from vegetation with greater than 50% cover of obligate and facultative wetland species to an area where there is less than 50% cover of these species. Usually this cut-off between wetland and terrestrial vegetation is quite distinct.

2. Table of plants and their Indicator Status*

Native Plants		
GYMNOSPERM TREES		
FACW	*Dacrycarpus dacrydioides*	kahikatea
FAC	*Dacrydium cupressinum*	rimu
FAC	*Podocarpus totara*	totara
TER	*Prumnopitys ferruginea*	miro
FAC	*Prumnopitys taxifolia*	matai
MONOCOT TREES		
FACW	*Cordyline australis*	ti kouka, cabbage tree
TER	*Cordyline banksii*	ti ngahere, forest cabbage tree
TER	*Rhopalostylis sapida*	nikau
DICOT TREES AND SHRUBS		
TER	*Alectryon excelsus* var. *excelsus*	titoki
TER	*Aristotelia serrata*	makomako, wineberry
TER	*Beilchmiedia tawa*	tawa
TER	*Brachyglottis greyi* var. *greyi*	
TER	*Brachyglottis repanda*	rangiora
TER	*Carmichaelia australis*	makaka, moukoro
TER	*Carpodetus serratus*	putaputäwëtä
TER	*Coprosma areolata*	
TER	*Coprosma crassifolia*	
TER	*Coprosma grandifolia*	kanono
TER	*Coprosma linariifolia*	
TER	*Coprosma lucida*	karamu
TER	*Coprosma microcarpa*	
FACW	*Coprosma propinqua* subsp. *propinqua* (incl. *C. propinqua* var. *latiuscula)*	mingimingi
FAC	*Coprosma propinqua* x *C. robusta*	
TER	*Coprosma rhamnoides*	
FAC	*Coprosma rigida*	
FAC	*Coprosma robusta*	karamu
TER	*Coprosma rotundifolia*	
TER	*Coprosma rubra*	
TER	*Coprosma* sp. "v" (of Eagle, 1982)	
FACW	*Coprosma tenuicaulis*	hukihuki, swamp coprosma
TER	*Coprosma tenuifolia*	
TER	*Coprosma virescens*	
TER	*Coprosma wallii*	

* Indicator status from Paul Champion, *pers. comm.* NIWA, 2003, apart from bryophytes (indicator status from Fife, A (2006) 'Wellington region wetland mosses'. Unpublished report prepared for Greater Wellington.

TER	*Cornynocarpus leavigatus*	karaka
TER	*Cyathodes juniperina*	prickly mingimingi
TER	*Cyathodes spp.* (*C.juniperina* agg. Druce 1971b)	
TER	*Discaria toumatou*	matagouri
FAC	*Elaeocarpus hookerianus*	pokaka
TER	*Fucshia excorticata*	kotukutuku, tree fuchsia
TER	*Fuchsia excorticata* x *F. perscandens*	
TER	*Gaultheria antipioda*	tawiniwini
TER	*Gaulteria rupestris*	
TER	*Geniostaoma rupeste* var. *liguistrifolium*	hangehange
TER	*Griselinia littoralis*	papauma
TER	*Griselinia lucida*	puka
TER	*Hebe parviflora* agg.	
TER	*Hebe stricta* var. *atkinsonii*	koromiko
TER	*Hebe stricta* var. *stricta*	koromiko
TER	*Hedycarya arborea*	porokaiwhiri, pigeonwood
TER	*Helichrysum lanceolatum*	niniao
TER	*Hoheria angustifolia*	narrow-leaved lacebark
TER	*Hoheria sexstylosa* var. *sexstylosa*	houhere, lacebark
TER	*Ileostylus micranthus*	mistletoe
TER	*Knightia excelsa*	rewarewa
TER	*Korthalsella clavata*	mistletoe
TER	*Korthalsella lindsayi*	mistletoe
TER	*Korthalsella salicronioides*	mistletoe
TER	*Kunzea ericoides* var. *ericoides*	kanuka
FAC	*Laurelia novae-zelandiae*	pukatea
FAC	*Leptospermum scoparium*	manuka
TER	*Leucopogon fasciculatus*	mingimingi
TER	*Lophomyrtus bullata*	ramarama
TER	*Lophomyrtus bullata* x *L. obcordata*	
TER	*Lophomyrtus obcordata*	rohutu
TER	*Macropiper excelsum* var. *excelsum*	kawakawa
FAC	*Melicope simplex*	poataniwha
FAC	*Melicytus micranthus* (incl. *M. m. var. microphyllus)*	mahoe-wao
TER	*Melicytus ramiflorus* subsp. *Ramiflorus*	mahoe
TER	*Melicytus* sp. “Blonden”	
TER	*Metrosideros robusta*	northern rata
TER	*Myoporum laetum*	ngaio
FAC	*Myrsine australis*	mapou
TER	*Myrsine divaricata*	
TER	*Myrsine salicina* (Druce 1971b)	toro
FAC	*Neomyrtus pedunculata*	rohutu
TER	*Nestegis cunninghamii*	black maire
TER	*Nestegis lancelata*	white maire
TER	*Nestegis Montana*	narrow-leaved maire
TER	*Nothofagus fusca*	red beech
TER	*Nothofagus menziesii* (Ogle *et al.* 1990a)	silver beech
TER	*Nothofagus solandri* var. *solandri*	black beech
TER	*Nothofagus solandri* x *N. truncate*	
TER	*Nothofagus truncata* (1996b)	hard beech
TER	*Olearia arborescens*	

TER	*Olearia paniculata*	
TER	*Olearia rani*	heketara
TER	*Olearia solandri*	
TER	*Olearia virgata var. virgata (*incl. *O. var. ramuliflora)* (Druce 1971b)	
TER	*Ozothamnus leptophyllus*	tauhinu
TER	*Pennantia corymbosa*	kaikömako
TER	*Pimelea arenaria*	sand daphne
TER	*Pittosporum cornifolium*	
TER	*Pittosporum divaricatum*	
TER	*Pittosporum eugenioides*	tarata; lemonwood
TER	*Pittosporum obcordatum*	
TER	*Pittosporum ralphii*	
TER	*Pittosporum tenuifolium* subsp. *Tenuifolium*	kohuhu
FAC	*Plagianthus divaricatus*	makaka, marsh ribbonwood
FACW	*Plagianthus divaricatus*	saltmarsh ribbonwood
RIP	*Plagianthus regius*	manatu, lowland ribbonwood
TER	*Pseudopanax arboreus* var. *arboreus*	whauwhaupaku, five finger
TER	*Pseudopanax crassifolius*	horoeka, lancewood
TER	*Pseudowintera axillaris*	
TER	*Pseudowintera colorata*	
TER	*Raukaua anomalus*	
TER	*Raukaua edgerleyi*	raukawa
TER	*Schefflera digitata*	pate
TER	*Solanum aviculare var. aviculare (*incl.*Solanum aviculare* var. *albiflorum* and *S. cheesemanii)* (Druce, 1987)	poroporo
RIP	*Solanum laciniatum*	poroporo
RIP	*Sophora micropylla*	kowhai
TER	*Sophora tetraptera*	kowhai
TER	*Streblus banksii*	larged-leaved milk tree
FAC	*Streblus heterophyllus*	turepo
OBL	*Syzygium maire*	maire tawake
TER	*Teucridium parvifolium (*incl*. Teucridium parvifolium* var. *luxurians)*	
TER	*Tupeia Antarctica*	mistletoe
TER	*Urtica ferox*	ongaonga
TER	*Weinmannia racemosa*	kamahi
MONOCOT LIANES		
TER	*Freycinetia banskii*	kiekie
TER	*Ripogonum scandens*	kareao, supplejack
DICOT LIANES		
FAC	*Calystegia sepium*	pohue
TER	*Calystegia tuguriorum (Druce 1971b)*	
TER	*Clematis foetida*	akakaikü
TER	*Clematis forsteri (incl. C. australis, C. bookeriana, C. petrieri)*	pöänanga
TER	*Clematis paniculata*	puawänanga
FAC	*Fuchsia perscandens*	

TER	*Metrosideros colensoi* (Druce 1971b)	rata
TER	*Metrosideros diffusa*	rata
TER	*Metrosideros fulgens*	rata
TER	*Metrosideros perforata*	aka
TER	*Muehlenbeckia australis*	pohuehue
TER	*Muehlenbeckia australis* x *M. complexa* (Druce 1971b)	
TER	*Muehlenbeckia complexa*	pohuehue
TER	*Parsonsia capsularis*	
TER	*Parsonsia capsularis* x *P. heterophylla* (Druce 1971b)	
TER	*Parsonsia heterophylla*	New Zealand jasmine
TER	*Passiflora tetrandra*	New Zealand passion Flower
FAC	*Rubus australis*	bush lawyer
TER	*Rubus australis* x *R. complexa* (Druce 1971b)	
TER	*Rubus australis* x *R. schmideloides* (Druce 1971b)	
TER	*Rubus australis* x *R. squarrosus* (Druce 1971b)	
TER	*Rubus cissoids* var. *cissoides*	bush lawyer
TER	*Rubus schmidelioides* var. *schmidelioides*	bush lawyer
TER	*Rubus squarrosus*	leafless bush lawyer
FACW	*Urtica linearifolia*	swamp nettle
LYCOPODS AND PSILOPSIDS		
AQU	*Isoetes kirkii*	
TER	*Lycopodium scariosum*	
TER	*Lycopodium varium (*incl. *L. billardierei & L. novaezelandicum;* Druce 1971*)*	
TER	*Lycopodium volubile*	
TER	*Tmesipteris elongate*	
TER	*Tmesipteris lanceolata*	
TER	*Tmesipteris tannensis*	
FERNS		
TER	*Adiantum aethiopicum* (Druce 1971b)	
TER	*Adiantum cunninghamii*	maidenhair fern
TER	*Adiantum diaphanum* (Druce 1971b)	huruhuru tapairu
TER	*Adiantum fulvum*	huruhuru tapairu
TER	*Anarthropteris lanceolata* (Druce 1971b)	
TER	*Anogramma leptophylla*	
TER	*Arthropteris tenella*	
TER	*Asplenium bulbiferum*	mouku
TER	*Asplenium bulbiferum* x *A. flaccidum* (Druce 1971b)	
TER	*Asplenium bulbiferum* x *A. hookerianum* (Druce 1971b)	
TER	*Asplenium flabellifolium*	
TER	*Asplenium flaccidum*	
TER	*Asplenium flaccidum* x *A. hookerianum*	
TER	*Asplenium gracillimum*	petako-paraharaha
TER	*Asplenium hookerianum*	petako-paraharaha
TER	*Asplenium oblongifolium*	shining splennwort
TER	*Asplenium polyodon*	pekato
AQU	*Azolla filiculoides*	floating water fern
TER	*Blechnum chambersii*	rereti

TER	*Blechnum discolour*	petipeti, crown ferm
TER	*Blechnum filiforme*	climbing blechnum
TER	*Blechnum fluviatile*	kiwikiwi
TER	*Blechnum membranaceum* (Druce 1971b)	
TER	*Blechnum novae-zelandiae s.s.*	kiokio
FACW	*Blechnum novae-zelandiae* (swamp form)	swamp kiokio
TER	*Blechnum penna-marina* subsp. *Alpine* (Ogle et al. 1990a)	
TER	*Blechnum procerum*	
TER	*Blechnum triangularifolium*	
TER	*Botrychium biforme*	
TER	*Ctenopteris heterophylla*	
TER	*Cyathea cunninghamii*	punui
TER	*Cyathea dealbata*	ponga
TER	*Cyathea medullaris*	mamaku
TER	*Cyathea smithii*	katote
TER	*Dicksonia fibrosa*	whekï-ponga
FAC	*Dicksonia squarrosa*	wheki
TER	*Diplazium australe*	
TER	*Doodia media*	
TER	*Grammitis billardierei* (Druce 1971b)	
TER	*Histiopteris incise*	water fern
TER	*Hymenophyllum bivalve*	mauku
TER	*Hymenophyllum cupressiforme*	
TER	*Hymenophyllum demissum*	irirangi
TER	*Hymenophyllum dilatatum*	mutua mauku
TER	*Hymenophyllum ferruginium*	
TER	*Hymenophyllum flexuosum*	mauku
TER	*Hymenophyllum multifidum*	mauku
TER	*Hymenophyllum rarum* (Druce 1971b)	mauku
TER	*Hymenophyllum revolutum*	mauku
TER	*Hymenophyllum sanguinolentum*	piripiri
TER	*Hymenophyllum scabrum* (Druce 1971b)	mauku
TER	*Hypolepis ambigua*	
TER	*Hypolepis rufobarbata*	
TER	*Lastreopsis glabella*	
TER	*Lastreopsis hispida*	
TER	*Lastreopsis microsora subsp. Pentangularis* (Druce 1971b)	
TER	*Lastreopsis velutina* (Druce 1971b)	
TER	*Lindsaea linearis*	
TER	*Lindsaea trichomanoides*	
TER	*Paesia scaberula*	ring fern
TER	Pellaea rotundifolia	tarawera
TER	*Phymatosorus pustulatus*	hound's tongue fern
TER	*Phymatosorus scandens*	mokimoki
OBL	*Pilularia novae-zelandiae* (Ogle et. Al. 1990a)	
TER	*Pneumatopteris pennigera*	pakau
TER	*Polystichum richardii*	
TER	*Polystichum silvaticum (Druce 1971b)*	
TER	*Polystichum vestitum*	
TER	*Pteridium esculentum*	

TER	*Pteris tremula*	
TER	*Pyrrosia eleagnifolia*	
TER	*Rumohra adiantiformis*	
TER	*Trichomanes endlicherianum*	
TER	*Trichomanes reniforme*	konehu
TER	*Trichomanes venosum*	
GRASSES		
OBL	*Amphibromus flutitans*	
TER	*Austrofestuca littoralis*	hinarepe
FAC	*Cortaderia fulvida*	toetoe
FAC	*Cortaderia toetoe*	toetoe
TER	*Deyeuxia avenoides*	
TER	*Deyeuzia quadriseta* (Hill 1962)	
TER	*Dichelachne crinata* (Druce 1971b)	
TER	*Echinopogon ovatus*	
TER	*Elymus multiflorus* (Hill 1962)	
OBL	*Isachne globosa*	swamp millet
FACW	*Lachnagrostis filiformis*	New Zealand wind-grass
TER	*Microlaena avenacea*	bush rice grass
TER	*Microlaena polynoda* (Druce 1971b)	
TER	*Microlaena stipoides*	
TER	*Oplismenus imbecillis*	
TER	*Poa anceps subsp. Anceps*	
TER	*Poa imbecilla*	
TER	*Poa pusilla* (Ogle *et al.* 1990a)	
TER	*Rytidosperma biannulare* (Hill 1962)	
TER	*Rytidosperma clavatum* (Druce 1971b)	
TER	*Rytidosperma gracile*	
SEDGES		
OBL	*Baumea rubiginosa*	
FAC	*Baumea tenax* (Ogle *et al.* 1990a)	
OBL	*Bolboschoenus caldwelli* (Ogle *et al.* 1990a)	purua grass
OBL	*Bolboschoenus fluviatilis* (Ogel *et al* 1990a)	purua grass
TER	*Carex buchananii*	
FAC	*Carex cirrhosa*	
FAC	*Carex dipsacea* var. *dipsacea*	
FAC	*Carex flagellifera*	manaia
TER	*Carex forsteri*	
FACW	*Carex gaudichaudiana*	
FACW	*Carex geminate s.s.*	
TER	*Carex inverse* (Druce 1971b)	
TER	*Carex lambertiana* (Druce 1971b)	
OBL	*Carex lessoniana* (Druce 1971b)	
OBL	*Carex maorica*	
FAC	*Carex pumila*	sand carex
TER	*Carex raoulii* s.s	
OBL	*Cares secta* s.s.	purei
FACW	*Carex sinclairii*	grass sedge

TER	*Carex solandri*	
TER	*Carex testacea*	
FACW	*Carex virgata*	purei
FACW	*Cyperus ustulatus*	toetoe upokotangata
TER	*Desmoschoenus spiralis*	pingao
OBL	*Eleocharis acuta*	sharp spike sedge
OBL	*Eleocharis gracilis* (Ogle et al. 1990a)	slender spike sedge
OBL	*Eleocharis pusilla* (Ogle et al. 1990a)	
OBL	*Eleocharis sphacelata*	bamboo spike sedge
TER	*Gahnia pauciflora*	täkahikahi
TER	*Isolepis cernua*	
OBL	*Isolepis distigmatosa*	
OBL	*Isolepis inundata* (Druce 1971b)	
TER	*Isolepis nodosa*	clubrush
OBL	*Isolepis prolifer*	
FAC	*Isolepis reticularis*	
FACW	*Leptocarpus similis* ≡ *Apodasmia similis*	oioi
TER	*Morelotia affinis*	
FACW	*Schoenoplectus pungens*	three square
OBL	*Schoenoplectus tabernaemontani*	kapungawha, lake club rush
TER	*Schoenus apogon*	
OBL	*Schoenus concinnus* (Ogle et al. 1990a)	
FAC	*Schoenus maschalinus* (Ogle et al. 1990a)	
TER	*Uncinia banksii*	matau
TER	*Uncinia ferruginea*	matau
TER	*Uncinia laxiflora* (Druce 1971b)	
TER	*Uncinia leptostachya*	
TER	*Uncinia rupestris (*incl*. U. angustifolia)* (Druce 1990c)	
TER	*Uncinia rupestris* x *U. uncinata*	
TER	*Uncinia scabra*	
TER	*Uncinia uncinata*	
TER	*Uncinia* sp. (unnamed; *aff. U. rupesetris*) (Druce 1971a)	
RUSHES		
FAC	*Juncus australis* (Druce 1971b)	wiwi
FACW	*Juncus caespiticus*	
FAC	*Juncus distegus* (Ogle et al. 1990a)	
FAC	*Juncus gregiflorus*	wiwi
FACW	*Juncus maritimus* var*. australiensis* ≡ *J. kraussii* subsp*. australiensis*	sea rush
FAC	*Juncus pallidus*	wiwi
TER	*Jancus planifolius*	
OBL	*Juncus pusillus* (Ogle *et al* 1990a)	wiwi
FAC	*Juncus sarophorus* (Druce 1971b)	wiwi
TER	*Luzula picta* s.s. (Druce 1971b)	
MONOCOT HERBS (OTHER THAN ORCHIDS, GRASSES, SEDGES, RUSHES)		
TER	*Arthropodium candidum (Druce 1971b)*	
TER	*Astelia fragrans*	kakaha
TER	*Astelia solandri*	kowharawhara

TER	*Collospermum hastatum*	kahakaha
TER	*Dianella nigra*	turutu
AQU	*Lemna minor*	duckweed
AQU	*Lepilaena bilocularis*	
TER	*Libertia grandiflora*	mïkoikoi
TER	*Libertia ixioides (Druce 1971b)*	mikoikoi
TER	*Phormium cookianum*	wharariki, flax
FACW	*Phormium tenax*	harakeke, flax
AQU	*Potamogeton ochreatus* (Ogle et al. 1990a)	blunt Pond weed
AQU	*Potamogeton pectinatus*	fennel-leaved pond weed
AQU	*Potamogeton suboblongus*	
AQU	*Ruppia megacarpa*	
AQU	*Ruppia polycarpa*	horse's mane weed
OBL	*Triglochin striata*	arrow grass
OBL	*Typha orientalis*	raupo
AQU	*Wolffia australiana* (Ogle et al. 1990a)	water meal
AQU	*Zannichellia palustris* (Ogle et al. 1990a)	
COMPOSITE HERBS		
TER	*Anaphaloides bellidioides*	
TER	*Centipeda minima*	
TER	*Cotula australis*	
TER	*Cotula coronopifolia*	bachelor's button
TER	*Craspedia uniflora* var. *grandis* (Wassiflieff *et al.* 1986)	
TER	*Craspedia viscose*	
TER	*Gnaphalium audax*	
TER	*Gnaphalium gymnocephalum*	cudweed
TER	*Gnaphalium involucratum* (Druce 1971b)	cudweed
TER	*Gnaphalium limosum* (Druce 1971b)	cudweed
TER	*Gnaphalium sphaericum*	
TER	*Lagenifera pumila*	papataruwharuwha
TER	*Lagenifera strangulate*	
TER	*Leptinella dioica subsp. Dioica* {see Lloyd (1972) p. 321]	
TER	*Leptinella dispersa subsp. dispersa*	
FAC	*Leptinella maniotototo*	
TER	*Leptinella squalida subsp. Squalida*	
TER	*Pseudognaphalium luteoalbum*	cudweed
TER	*Senecio glomeratus* (Druce 1971b)	fireweed
TER	*Senecio hispidulus* (Druce 1971b)	fireweed
TER	*Senecio minimus*	fireweed
TER	*Senecio quadridentatus* (Druce 1971b)	
DICOT HERBS (OTHER THAN COMPOSITES)		
TER	*Acaena anserinifolia*	piripiri
TER	*Acaena juvenca*	
TER	*Aciphylla squarrosa s.s.*	
TER	*Apium prostratum*	New Zealand celery
TER	*Australina pusilla*	
TER	*Callitriche muelleri*	
OBL	*Callitriche petriei* subsp. *petriei* (Druce 1971b)	

TER	*Cardamine* sp. (a) [*C. debilis* agg., 'Narrow petal' of Pritchard 1957] (Druce 1971b)	bittercress
TER	*Cardamine* sp. (a) [*C. debilis* agg., 'Long style' of Pritchard 1957] (Druce 1990a)	bittercress
TER	*Cardamine* sp. (a) [*C. debilis* agg., 'Glossy Leaf' of Pritchard 1957] (Druce 1990a)	
TER	*Cardamine* sp. (d) [cf. C. corymbosa. "Mainland Coastal Race" of Pritchard 1957] (Ogle *et al.* 1990a)	
FACW	*Centella uniflora*	
FAC	*Centipeda cunninghamii*	sneezewort
TER	*Chenopodium glaucum* var. *ambiguum* (Druce 1971b)	
TER	*Colobanthus apetalus (*incl. *C. a. var. alpinus)*	
TER	*Coriaria sarmentosa* (Hill 1962)	
TER	*Crassula kirkii*	
TER	*Crassula moschata* (WELT 50140; 1895 record)	
OBL	*Crassula ruamahanga*	
OBL	*Crassula sinclairii*	
TER	*Daucus glochidiatus* (Hill 1962)	native carrot
TER	*Dichondra repens* (Druce 1971b)	
TER	*Dichondra sp. (D. brevifolia agg.) (*Ogle *et al.* 1990a*)*	
TER	*Drosera peltata* subsp. *auriculata*	
OBL	*Elatine gratioloides* (Ogle *et al.* 1990a)	
TER	*Epilobium knomarovianum* (Ogle *et al.* 1990a)	
TER	*Epilobium chionanthum* (Ogle *et al.* 1990a)	willow herb
FAC	*Epilobium insulare* (Ogle *et al.* 1990a)	willow herb
TER	*Epilobium komarovianum (Ogle et al. 1990a)*	
TER	*Epilobium nerteroides (Ogle et al. 1990a)*	
TER	*Epilobium nummulariifolium*	willow herb
FAC	*Epilobium pallidiflorum* (Ogle *et al.* 1990a)	willow herb
TER	*Epilobium pedunculare agg.*	
TER	*Epilobium rotundifolium*	
TER	*Eryngium vesciculosum*	sea holly
TER	*Euphrasia cuneata*	
TER	*Galium propinquum (Druce 1971b)*	mawe
TER	*Galium trilobum*	
FAC	*Galium* sp. [unnammed; cf. *G.perpusillum*; see mason (1951)] (Ogle et al. 1990a)	
TER	*Geranium microphyllum (Druce 1971b)*	
TER	*Gingidia Montana (Hill 1962)*	
OBL	*Glossostigma cleistanthum*	
OBL	*Glossostigma diandrum* (Ogle et al. 1990a)	
OBL	*Glossostigma elatinoides* (Ogle et al. 1990a)	
FAC	*Gonocarpus micranthus* subsp. *micranthus*	
OBL	*Gratiola sexdentata*	
TER	*Gunnera monoica (incl. G. albocarpa & G. strigosa) (Mason 1951)*	
TER	*Gunnera prorepens*	
TER	*Haloragis erecta subsp. Erecta*	toatoa
TER	*Hydrocotyle dissecta*	
TER	*Hyrocotyle elongate*	
TER	*Hydrocotyle heteromeria*	
FACW	*Hydrocotyle hydrophila* (Ogle et al 1990a)	

FAC	*Hydrocotyle moschata*	
FAC	*Hydrocotyle novae-zealandiae s.s.*	
FACW	*Hydrocotyle pterocarpa*	
FAC	*Hypericum japonicum*	
OBL	*Hypsela rivalis* (see Mason 1951)	
TER	*Lepidium oleraceum (Hill 1962)*	
FACW	*Lilaeopsis novae-zelandiae*	
FACW	*Lilaeopsis ruthiana*	
FACW	*Limosella lineata* (CHR 417049)	
FAC	*Lobelia anceps*	shore lobelia
FAC	*Mazus novaezeelandiae* subsp. *novaezealandiae*	dwarf musk
OBL	*Mimulus repens*	native musk
TER	*Myosotis spathulata (incl. M. s. var. radicata)*	
OBL	*Myriophyllum propinquum*	water milfoil
OBL	*Myriophyllum robustum* (Hill 1962)	
OBL	*Myriophyllum triphyllum*	water milfoil
FACW	*Myriophyllum votschii* (Ogle et al. 1990a)	
FAC	*Nertera depressa* (incl. *N. cunninghamii*)	
TER	*Nertera setulosa (Ogle et al. 1990a)*	
TER	*Oxalis exilis*	
TER	*Parietaria debilis*	
TER	*Pelargonium inodorum*	kopata
TER	*Plantago raoulii (Druce 1971b)*	kopakopa
FAC	*Potentilla anserinoides*	kowai
FAC	*Pratia angulata*	panakenake
OBL	*Pratia perpusilla* (Ogle et al. 1990a)	
TER	*Ranunculus acaulis*	sand buttercup
OBL	*Ranunculus amphitrichus*	waoriki
FACW	*Ranunculus glabrifolius* (Druce 1971b)	kawariki
OBL	*Ranunculus limosella* (Ogle et al. 1990a)	
OBL	*Ranunculus macropus* (Ogle et al. 1990a)	
TER	*Ranunculus reflexus*	maruru
FACW	*Rorippa palustris*	
FAC	*Rumex flexuosus*	
TER	*Samolus repens var. repens*	
TER	*Scandia geniculata (Hill 1962)*	
FACW	*Schizeilema trifoliolatum*	
TER	*Scleranthus biflorus*	
TER	*Sebaea ovata (WELT 47848, date unknown – early 1900s)*	
TER	*Selliera radicans*	remuremu
TER	*Solanum americanum (Ogle et al. 1990a)*	
TER	*Stellaria decipiens (incl. S. minuta and S. parviflora)*	kohukohu
TER	*Urtica incise*	Stinging nettle
TER	*Viola lyallii*	
TER	*Wahlenbergia sp.*	

Exotic Plants		
GYMNOSPERMS		
TER	*Pinus pinaster*	maritime pine
TER	*Pinus radiate*	radiate pine
TER	*Cupressus macrocarpa*	macrocarpa
DICOT TREES AND SHRUBS		
TER	*Acer pseudoplatanus*	sycamore
FACW	*Alnus glutinosa*	alder
TER	*Berberis glaucocarpus*	barberry
TER	*Betula sp.*	birch
TER	*Chamaecytisus palmensis*	tree Lucerne
TER	*Cotoneaster glaucophyllus f. serotina*	cotoneaster
FAC	*Cratagus monogyna*	hawthorn
TER	*Cytisus scoparius*	broom
TER	*Elaeagnus x reflexa*	elaeagnus
TER	*Euonymus europaeus*	spindle tree
TER	*Hydrangea macrophylla*	hydrangea
TER	*Hypericum androsaemum*	tutsan
TER	*Juglans regia*	walnut
TER	*Ligustrum ovalifolium*	privet
TER	*Lupinus arboreus*	lupin
TER	*Lycium ferocissimum*	boxthorn
TER	*Malux x domestica*	apple
TER	*Physalis peruviana*	cape gooseberry
TER	*Populus alba cv. Nivea*	silver poplar
TER	*Populus ngira cv. Italica*	lombardy poplar
TER	*Prunus cerasifera*	cherry plum
TER	*Prunus persicaria*	peach
TER	*Pseudotsuga menziesii*	douglas fir
TER	*Pyracantha sp.*	firethorn
TER	*Robinia pseudacacia*	false acacia
TER	*Rosa rubiginosa*	sweet brier
TER	*Rubus sp. (R. fruticosus agg.)*	blackberry
TER	*Rubus laciniatus*	cut-leaved blackberry
FACW	*Salix alba* var. *vitellina*	golden willow
FAC	*Salix babylonica*	weeping willow
FACW	*Salix cinerea*	grey willow
FACW	*Salix fragilis*	crack willow
TER	*Sambucus ngira*	elder
TER	*Solanum mauritianum*	woolly nightshade
TER	*Solanum pseudocapsicum*	jerusalem cherry
FAC	*Ulex europaeus*	gorse
DICOT LIANES		
TER	*Asparagus asparagoides*	smilax
TER	*Calystegia silvatica*	great bindweed
TER	*Clematis vitalba*	old man's beard

TER	*Cobaea scanderis*	cathedral bells
TER	*Convolvulus arvensis*	field bindweed
TER	*Hedera helix*	ivy
FAC	*Lonicera japonica*	japanese honeysuckle
TER	Senecio mikanioides	germany ivy
LYCOPSIDS		
TER	*Selaginella kraussiana*	
GRASSES		
TER	*Agrostis capillaries*	brown-top
TER	*Agrostis castellana* (Ogle *et al.* 1990a)	dryland browntop
TER	*Agrostis gigantean*	redtop
FAC	*Agrostis stolonifera*	creeping bent
FAC	*Alopecurus geniculatus*	kneed foxtail
TER	*Anthoxanthum odoratium*	sweet vernal
TER	*Arrhenatherum elatius*	tall oat grass
TER	*Bromus diandrus*	ripgut brome
TER	*Bromus willdenowii*	prairie grass
TER	*Cortaderia swelloana*	pampas
TER	*Cynosurus cristatus*	crested dogtail
TER	*Dactylis glomerata*	cocksfoot
TER	*Echinochloa crus-gallii* (Ogle *et al.* 1990a)	barnyard grass
TER	*Ehrharta erecta*	veld grass
TER	*Elytrigia repens*	twitch, couch
TER	*Festuca arundinacea* ≡ *Schedonorus phoenix*	tall fescue
TER	*Festuca nigrescens* (Ogle *et al.* 1990a)	chewing fescue
TER	*Festuca rubra* (Hill 1962)	red fescue
OBL	*Glyceria declinata*	floating sweet grass
TER	*Glyceria striata*	
FAC	*Holcus lanatus*	yorkshire fog
TER	*Hordeum murinum*	barley grass
TER	*Lagurus ovatus*	harestail
TER	*Lolium perenne*	perennial ryegrass
TER	*Paspalum dilatatum*	paspalum
FACW	*Paspalum distichum*	mercer grass
TER	*Phalaris aquatica*	
TER	*Phleum pratense*	timothy
TER	*Poa annua*	annual poa
TER	*Poa trivialis* (Ogle *et al.* 1990a)	rough-stalked meadow grass
TER	Rytidosperma racemosum (Ogle *et al.* 1990a)	danthonia
TER	Stipa sp. (Hill 1962)	
SEDGES		
TER	*Carex otrubae* (Ogle *et al.* 1990a)	
TER	*Carex sylvatica* (Ogle *et al.* 1990a)	
FAC	*Cyperus eragrostis*	
FAC	*Isolepis marginata* (Ogle *et al*. 1990a)	

RUSHES		
FACW	*Juncus articulatus*	jointed rush
TER	*Juncus bufonius*	
TER	*Juncus dichotomus* (Ogle *et al.* 1990a)	
FAC	*Juncus effusus*	
FACW	*Juncus microcephalus*	
TER	*Juncus tenuis*	
MONOCOT HERBS (OTHER THAN GRASSES, SEDGES AND RUSHES)		
TER	*Agapanthus praecox*	agapanthus
TER	*Alisma lanceolatum*	water plantain
TER	*Allium triquetum*	three-cornered garlic
AQU	*Aponogeton distachyus* (Ogle *et al*. 1990a)	cape pond weed
TER	*Crocosmia x crocosmiiflora*	montbretia
AQU	*Elodea canadensis*	canadian pond weed
FACW	*Iris pseudacorus* (Ogle *et al*. 1990a)	yellow flag
AQU	*Potamogeton crispus*	curled pond weed
TER	*Sisyrinchium iridifolium*	
TER	*Sisyrinchium sp. "blue"*	
AQU	*Spirodela punctata* (Ogle *et al.* 1990a)	purple-backed duckweed
TER	*Tradescantia fluminensis*	wandering Jew
FAC	*Zantedeschia aethiopica*	arum lily
DICOT HERBS (COMPOSITE FAMILY)		
TER	*Achillea millefolium`*	yarrow
TER	*Anthemis cotula*	stinking mayweed
TER	*Aster lanceolatus*	michaelmas daisy
FAC	*Aster subulatus*	sea aster
FACW	*Bidens frondosa*	beggar's ticks
TER	*Carduus tenuiflorus*	winged thistle
TER	*Centipeda cunninghamii*	sneezewort
TER	*Chamaemelum nobile*	chamomile
TER	*Cichorium intybus*	chicory
TER	*Cirsium arvense*	californian thistle
TER	*Cirsium vulgare*	scotch thistle
TER	*Conyza bilbaoana*	fleabane
TER	*Conyza Canadensis*	wavy-leaved fleabane
TER	*Crepis capillaries*	hawkes beard
TER	*Gnaphalium coarctatum*	cudweed
TER	*Hypochoeris radicata*	catsear
TER	*Lapsana communis*	nipplewort
TER	*Leontodon tarazacoides*	hawkbit
TER	*Leucanthemum vulgare*	oxeye daisy
TER	*Matricaria dioscoidea*	rayless chamomile
TER	*Mycelis muralis*	wall lettuce
TER	*Picris echioides*	oxtongue
TER	*Senecio jacobaea*	ragwort
TER	*Silybum marianum*	variegated thistle

TER	*Soliva sessilis*	onehunga weed
TER	*Sonchus asper*	prickly sowthistle
TER	*Sonchus oleraceus*	puha, sowthistle
TER	*Tarazacum officinale*	dandelion
TER	*Xanthium spinosum* (Hill 1962)	bathurst bur
DICOT HERBS (OTHER THAN COMPOSITE FAMILY)		
TER	*Acaena agnipila*	australian sheep's bur
TER	*Acaena novae-zelandiae*	
TER	*Alcea rosea*	hollyhock
TER	*Amaranthus retroflexus* (Ogle *et al.* 1990a)	amaranthus
TER	*Anagallis arvensis*	scarlet pimpernel
TER	*Apium graveolens*	wild celery
TER	*Brassica napus* (Hill 1962)	swede
TER	*Brassica oleracea* (Hill 1962)	wild cabbage
TER	*Brassica rapa* (Hill 1962)	turnip
FACW	*Callitriche stagnalis*	starwort
TER	*Capsella bursa-pastoris*	shepherd's purse
TER	*Cardamine hirsuta*	bitter-cress
TER	*Centaurium erythraea*	century
TER	*Cerastium glomeratum*	mouse-eared chickweed TER
TER	*Chamaecytisus palmensis*	tagasaste
TER	*Chenopodium album agg.*	fathen
TER	*Chenopodium murale*	nettle-leaved fathen
TER	*Chenopodium pumilio*	clammy goosefoot
TER	*Ciclospermum leptophyllum* (Ogle *et al.* 1990a)	slender celery
TER	*Conium maculatum*	hemlock
TER	*Coronopus didymus*	twin cress
TER	*Crassula decumbens* (Ogle *et al.* 1990a)	cape crassula
TER	*Cucurbita maxima*	pumpkin
TER	*Datura stramonium*	thorn apple
TER	*Dianthus armerria*	deptford pink
TER	*Dipsacus syvestris* (Ogle *et al.* 1990a)	wild teasel
TER	*Epilobium ciliatum*	willow herb
TER	*Erodium cicutarium* (Ogle *et al.* 1990a)	storksbill
TER	*Erodium moschatum*	storksbill
TER	*Euphorbia peplus*	milkweed
TER	*Foeniculum vulgare*	fennel
TER	*Fumaria muralis*	scrambling fumitory
TER	*Fumaria officinalis*	fumitory
TER	*Galium aparine*	cleavers
FACW	*Galium palustre*	marsh bedstraw
TER	*Geranium molle*	dove's foot cranesbill
TER	*Hyoscyamus niger*	henbane
TER	*Lamium amplexicaule*	henbit
TER	*Lathyrus odoratus*	sweet pea
TER	*Lepidium bonariense* (Ogle *et al.* 1990a)	argentine cress
TER	*Ligustrum ovalifolium*	privet
TER	*Linum bienne*	pale flax
FAC	*Lotus pedunculatus*	lotus major
TER	*Lotus suaveolens*	hairy lotus

OBL	*Ludwigia palustris*	
TER	*Lythrum hyssopifolia*	hyssop loosestrife
TER	*Malva neglecta*	dwarf marrow
TER	*Melilotus indica*	king Island melilot
FAC	*Mentha pulegium*	pennyroyal
FAC	*Mentha spicata*	spearmint
FAC	*Mentha* x *piperita* var. *citrata*	bergamot mint
FACW	*Mimulus guttatus*	monkey musk
TER	*Modiola caroliniana*	creeping marrow
FACW	*Myosotis laxa* subsp. *caespitosa*	water forget-me-not
OBL	*Nasturtium officinale* ≡ *Rorippa nasturtium-aquaticum*	watercress
TER	*Navarretia squarrosa*	californian stinkweed
TER	*Oenanthe pimpinelloides*	parsley dropwort
TER	*Orobanche minor*	broomrape
TER	*Parentucellia viscose*	tarweed
TER	*Pastinaca sativa*	wild parsnip
TER	*Plantago lanceolata*	narrow-leaved plantain
TER	*Plantago major*	broad-leaved plantain
TER	*Polygonum aviculare*	wireweed
FAC	*Polygonum hydropiper* ≡ *Persicaria hydropiper*	water pepper
TER	*Polygonum persicaria*	willow weed
TER	*Prunella vulgaris*	selfheal
TER	*Ranunculus acris*	giant buttercup
FACW	*Ranunculus flammula*	spearwort
FAC	*Ranunculus repens*	creeping buttercup
FACW	*Ranunculus sceleratus*	celery-leaved buttercup
AQU	*Ranunculus trichophyllus* (Ogle *et al.* 1990a)	water buttercup
TER	*Raphanus raphanistrum* subsp. *raphanistrum*	wild radish
TER	*Rorippa nasturtium-aquaticum*	watercress
TER	*Rumex acetoslla*	sheep's sorrel
FAC	*Rumex conglomeratus*	clustered dock
FAC	*Rumex crispus*	curled dock
TER	*Rumex obtusifolius*	broad-leaved dock
TER	*Rumex sagittatus*	climbing dock
TER	*Sagina procumbens*	pearlwort
TER	*Sedum acre*	stonecrop
TER	*Sisymbrium officinale*	hedge mustard
TER	*Sisymbrium orientale*	oriental mustard
TER	*Solanum nigrum*	black nightshade
TER	*Solanum physalifolium*	hairy nightshade
TER	*Solanum tuberosum*	potato
TER	*Spergula arvensis*	spurrey
TER	*Stellaria graminea* (Ogle *et al.* 1990a)	stickwort
TER	*Stellaria media*	chickweed
TER	*Trifolium dubium*	suckling clover
TER	*Trifolium fragiferum* (Ogle *et al.* 1990a)	strawberry clover
TER	*Trifolium pratense*	red clover
TER	*Trifolium repens*	white clover
TER	*Trifolium subterraneum*	subterranean clover
TER	*Urtica urens*	nettle
TER	*Verbascum thapsus*	woolly mullein
TER	*Verbascum virgatum*	moth mullein

TER	*Verbena bonariensis*	purple-top
OBL	*Veronica anagallis-aquatica*	water speedwell
TER	*Veronica persica*	scrambling speedwell
OBL	*Veronica scutellata* (Ogle *et al.* 1990a)	marsh speedwell
TER	*Veronica serpyllifolia*	speedwell
TER	*Vicia hirsulta*	hairy vetch
TER	*Vicia sativa*	vetch
TER	*Viola odorata*	violet

Mosses		
FACW	*Breutelia pendula* (Sm.) Mitt. (1859) FACW.	
FACW	*Bryum pseudotriquetrum* (Hedw.) P.Gaertn., E. Meyer & Schreb. (1816) FACW. ##	
FACW	*Calliergonella cuspidata* (Hedw.) Loeske (1911) FACW.	
OBL	*Campylopus acuminatus* var. *kirkii* (Mitt.) J.-P.Frahm (1987) OBL.	
FAC	*Campylopus introflexus* (Hedw.) Brid. (1819) FAC.	
FACW	*Distichophyllum pulchellum* var. *ellipticifolium* Sainsbury (1947) FACW.	
FACW	*Drepanocladus aduncus* (Hedw.) Warnst. (1903) FACW.	
FACW	*Drepanocladus brachiatus* (Mitt.) Dixon (1912) FACW.	
OBL	*Fissidens adianthoides* Hedw. (1801) OBL.	
AQU	*Fissidens berteroi* (Mont.) Müll.Hal. (1848) AQU and RIP.	
FAC	*Hypnum cupressiforme* Hedw. var. *cupressiforme* FAC.	
OBL	*Leptodictyum riparium* (Hedw.) Warnst. (1906) OBL.	
FACW	*Notoligotrichum bellii* (Broth.) G.L.Sm. (1971) FACW.	
FAC	*Philonotis pyriformis* (R.Br.bis) Wijk & Margad. (1962) FAC.	
FACW	*Polytrichum commune* Hedw. (1801). FACW.	
FAC	*Sphagnum australe* Mitt. (1859) FAC. ##	
OBL	*Sphagnum cristatum* Hampe (1874) OBL.	
OBL	*Sphagnum falcatulum* Besch. (1885) OBL.	
OBL	*Sphagnum novo-zelandicum* Mitt. (1859) OBL	
OBL	*Sphagnum squarrosum* Crome (1803) OBL. ##	
FACW	*Warnstorfia fluitans* (Hedw.) Loeske (1907)	

Appendix 3: Wetland Identification Form, example.

Table 1: General Site Information

Date: 6 April 2005	Assessor(s): Owen Spearpoint
Grid Reference: E 26 938 70 N 60 186 50	Address: Maymorn Hutt Catchment
Landowner: Greater Wellington	Have you taken photographs? YES / ~~NO~~ See attached.
Any signs of human modification? (detail): No sign.	
Has the area been identified as a wetland before?: ~~YES~~ / NO Source:	
Have you attached a map of the area?: YES / ~~NO~~ See attached Approximate size of area assessed: 4 ha	

EXAMPLE

Table 2: Plants

Species	% cover	Indicator Status				Native? (tick)
		OBL	FACW	FAC	TER	
TREES[2]					✓	✓
1. Silver beech	35%			✓		✓
2. Halls Totara	25%					
3.						
SHRUBS						
1. Weeping mapou	25%				✓	✓
2. Turpentine scrub	25%			✓		✓
3. Manuka	5%			✓		✓
GROUND COVER						
1. *Gleicheia dicarpa*	55%		✓			✓
2. *Sphagnum spp.*	35%	✓				✓
3. *Lycopodium scariosum*	25%			✓		✓
4.						
5.						
TOTAL		35%	55%		25%	

Total area OBL + FACW plants = 90%

Total area TER = 60%

(OBL + FACW) – (TER) = +30%*

* If this number is positive than the area can be considered a wetland.

EXAMPLE

[2] Note: only a limited number of spaces are provided as only the dominant plants are listed. Only include plants which have the highest cover percentages (generally over 20%) in any vegetation layer.

Table 3: Additional comments

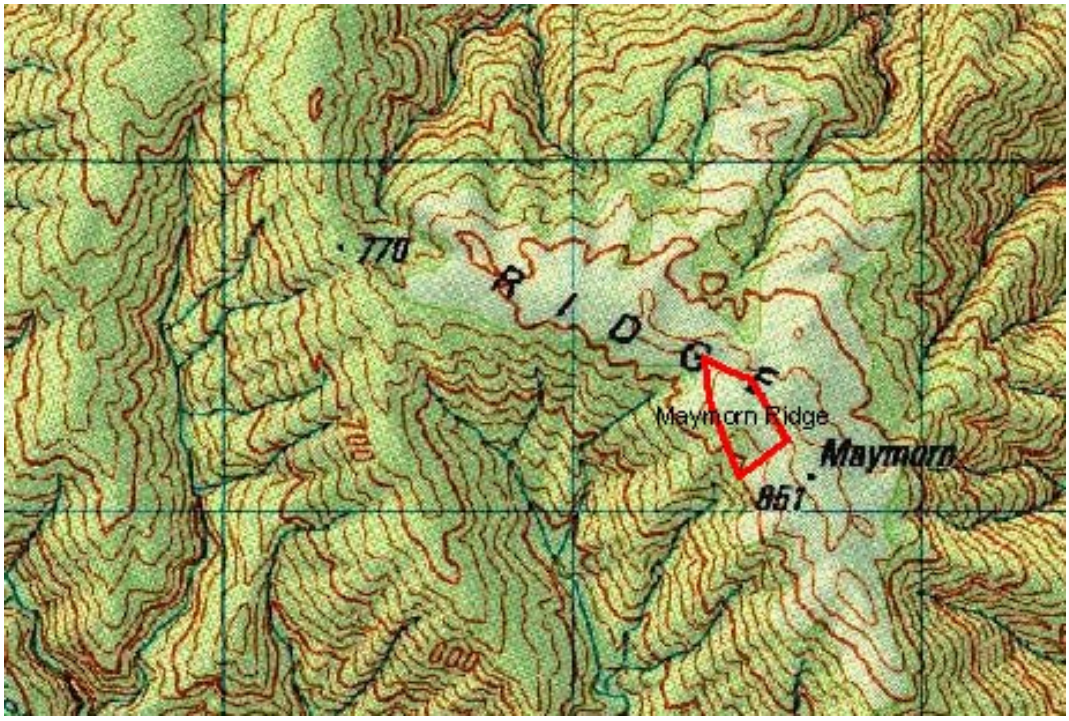
Further vegetation comments: (e.g. any rare or special plants?): No exotic species present. Tangle fern is not common in the Wellington region
Hydrology comments: (Depth of surface water, depth to free water in pit, depth to saturated soil) In the areas where sphagnum is growing (usually next to obvious flow channels) the soils were saturated to the surface and free water was 10-30mm below the surface. In the areas of *Gleichenia* free water was found from 30-180mm deep. Soils were saturated to similar depth.
Recent weather patterns (if known): Generally fine, warm with average rainfall.
Soils comments: Humus layer 50mm deep over a loamy soil that has become gleyed and water logged.

EXAMPLE

Table 4: Wetland determination

Summary: Is the area a wetland? YES/~~NO~~ Supporting comments: The site is at the head of a basin that holds significant amounts of water. There are large areas of sphagnum moss present. Where seen, the soils had clear signs of anaerobic activity.

EXAMPLE



A Greater Wellington staff member assessing whether the areas identified in the map above is a wetland.

Appendix 4: Further reading and other resources

Wetland plant identification

Books

- Johnson and Brooke (1998) *Wetland plants in New Zealand.* Landcare Research.

Web-based resources

- The National Centre for Aquatic Biodiversity and Biosecurity has on-line plant identification guides - visit their website at www.niwascience.co.nz/ncabb.
- Greater Wellington's website profiles 10 common wetland plants in the region at www.gw.govt.nz/wetlands.
- The New Zealand Plant Conservation Network's website has photos and descriptions of native and exotic plants, and is a useful identification resource. See www.nzpcn.org.nz

Wetland types

Johnson and Gerbeaux (2004) *Wetland types in New Zealand.* Department of Conservation

Johnson and Rogers (2003) *Ephemeral wetlands and their turfs in New Zealand. Science for Conservation 230.* Department of Conservation.

Wetland identification and delineation – overseas publications

- Tiner, R. W. (1999) Wetland Indicators: *A guide to wetland identification, delineation, classification and mapping*. CRC press, Boca Raton, Florida.
- US Army Corp of Engineers. (1987) *Corp of Engineers Wetland Delineation Manual. Technical report Y-87-1*.

Wetland case law (selected extracts)

In New Zealand, wetlands are a valuable but rapidly diminishing resource. **A relatively insignificant and small scale wetland can, therefore, still be of national importance under s 6(a). Wetlands should not be interfered with unless no reasonable alternatives are available and mitigation measures are not possible:** *Te Runanga o Ati Awa ki Whakarongotai Inc v Kapiti DC* EnvC w23/2002, noted [2002] BRM Gazette 105. (This aspect of the Environment Court's decision was not subject to appeal to the High Court – see *Takamore Trustees v Kapiti Coast DC* [2003] NZRMA 433 (HC), noted [2003] BRM Gazette 75.) See also A6.08A

The Director General of Conservation v N G and A R Ferguson and West Coast Regional Council (c/9/2006) has information on when a wetland is 'part of a river or lake bed' (e.g. covered by s13 applies) and no activity can occur unless expressly allowed for in a regional plan or resource consent) and **confirms that areas with non-native plants can be considered to meet the RMA definition of 'wetland'.**

ANNEXURE D – PROPOSED CONDITIONS REFERRED TO IN THIS REBUTTAL STATEMENT

Recommended additions are marked in underline and deletions are marked in ~~strikethrough~~.

Reference	Wording of Draft Conditions
G.19	The management of key environmental effects associated with the construction phase of the project shall be detailed within the environmental management plans that are included in the appendices to the CEMP (draft plans were submitted with the applications). The finalised management plans shall be submitted to the Manager for certification at least 15 working days before the commencement of construction. Works shall not commence until the consent holder has received the Manager's written certification for the management plan(s). The CEMP shall identify how the management plans have been integrated with each other to manage ecological, groundwater, settlement and contamination effects. This suite of management plans consist of: a) Erosion and Sediment Control Plan b) Groundwater (Level) Management Plan c) Settlement Effects Management Plan d) Contaminated Soils and Groundwater Management Plan e) Ecological Management Plan.
G.34	a) The consent holder shall ~~finalise~~, submit ~~and implement through the CEMP,~~ the Ecological Management Plan (EMP). The EMP shall be submitted to the Manager for certification at least 15 working days prior to works commencing. The purpose of the Plan is to: i. ~~This EMP shall also~~ Outline the ecological management programme to ~~protect, reduce and remediate~~ avoid, remedy and mitigate impacts on the environment during the construction phase of the Project; ii. Document the permanent mitigation measures, such as restoration planting, and the mechanisms by which to develop relevant mitigation and restoration plans for terrestrial and freshwater habitat. iii. Ensure through post-construction monitoring that mitigation has been achieved; and iv. Ensure through post-construction monitoring that any long-term effects are remediated through adaptive management or mitigated. b) The EMP shall be finalised in consultation with Te Ati Awa ki Whakarongotai and Takamore Trust. c) The EMP shall detail the monitoring to be undertaken pre-construction, during construction and post-construction as outlined below in Condition G.38-G.40. The EMP shall detail the role that Te Ati Awa ki Whakaronqotai and Takamore Trust will have observing monitoring.

Reference	Wording of Draft Conditions
	d) The EMP shall provide information on how the following outcomes will be achieved: i. Avoid, remedy and mitigate ~~Minimise~~ loss of valued vegetation and habitats: ii. Avoid, remedy and mitigate ~~Minimise~~ construction effects on freshwater and the marine environments; iii. Avoid, remedy and mitigate ~~Minimise~~ effects on identified wetlands resulting from hydrological changes to water tables, including undertaking pre-construction baseline Wetland Condition Monitoring (Clarkson et al, 2003) along a permanent transect within each of the eco tones present within the following wetlands: Raumati Manuka Wetland; Otaihanga Northern Wetland; Otaihanga Southern Wetland; El Rancho Wetland (Weggery) and the Ngarara Wetland; iv. Minimise effects on fish during stream works; v. Minimise disturbance of nationally threatened or at-risk birds (as listed by the most up to date Department of Conservation threat classification lists) during breeding periods; vi. Develop a Lizard Management Plan specifying that prior to any construction in the vicinity of the El Rancho wetland, a series of tracks should be cut through the scrub within the Project footprint to allow the area to be searched for arboreal lizards. The Lizard Management Plan should also outline mechanisms to capture and move lizards from the El Rancho area, including gathering the necessary Wildlife Act 1953 permits, as well as mechanisms for re-establishing ~~.Re-establish~~ affected lizard habitat and minimising ~~minimise~~ lizard mortality resulting from construction of the Project: vii. Carry out monitoring in a manner that will confirm that adverse effects are as predicted; any exceedance is identified: and appropriate actions are undertaken to rectify; viii. Ensures that mitigation requirements are undertaken and monitored to ensure success is achieved; and ix. Carry out monitoring in a manner that confirms that mitigation meets objectives. x. ~~t~~The North Island fernbird population is not adversely affected by construction or operation of the Project~~:~~; xi. ~~t~~The monitoring of culverts; and fish passages –by Te Atiawa Ki Whakarongotai and Takamore Trust during construction. xii. Ensure that in the event of additional vegetation or habitat loss outside of the Project footprint, including Project-related hydrological changes to wetlands, mitigation calculations are consistent with the Environmental Compensation Ratios outlined in the EMP.

Reference	Wording of Draft Conditions
G.35	The EMP shall be prepared by suitably qualified and experienced ecologist, and shall implement the ~~principles and outcomes~~ recommendations of ~~sought by~~ the Ecological Impact Assessment~~s~~ (Technical Report~~s~~ 26~~ – 31~~). The EMP shall be prepared in accordance with: a) NZTA's Environmental Plan; b) The Conservation Management Strategy for the Wellington Conservancy; and c) The Greater Wellington Pest Management Strategy (2009)
G.36	The EMP shall be consistent with the Landscape Management Plan (LMP) that is required to be certified by KCDC under the designation conditions.
G.37	At least 15 working days before submitting the EMP to GWRC for certification the Consent Holder shall submit a copy of the draft EMP required by Condition G.34 to KCDC for comment. Any comments received shall be supplied to the Manager when the EMP is submitted, along with a clear explanation of where any comments have not been incorporated and the reasons why.
G.38	Monitoring shall be carried out in accordance with the EMP as required by Condition G.34 in order to: a) collect baseline information and develop appropriate management triggers for ~~on~~ vegetation, wetlands, freshwater and marine ecology and fernbird for 1 year prior to construction work starting; b) ~~collect~~ monitor ecological information on vegetation, wetlands, freshwater and marine ecology and fernbird during construction work in accordance with the pre-construction baseline management triggers; c) ~~collect~~ monitor ecological information on vegetation, wetlands, freshwater and marine ecology, and fernbird for a minimum of 2 years post-construction works completion to confirm mitigation requirements outlined in G.34 are achieved; and d) undertake monitoring for adaptive management as detailed in Condition G.40.
G.39	All ecological monitoring required under the EMP shall be ~~managed~~ undertaken by a suitably qualified and experienced ecologist. The results of all monitoring carried out pursuant to the EMP shall be: a) available for inspection during normal office hours where such data is available; b) provided to Te Ati Awa ki Whakarongotai and Takamore Trust c) submitted to the Manager at quarterly intervals for certification that the appropriate monitoring has been undertaken; d) submitted to the Director-General of Conservation and KCDC for information; and e) summarised and submitted as part of the annual report required under Condition G.l4.

Reference	Wording of Draft Conditions
G.40	An Adaptive Management approach shall be taken to responding to ecological effects as outlined in the EMP. The Adaptive Management monitoring shall ~~seek to~~: a) Provide a level of baseline information of pre-construction vegetation, wetland~~s~~ hydrology, freshwater and marine habitats, and distribution of fernbird, in order to develop 'management trigger ' levels (where practicable) for each environment being monitored; b) Undertake monitoring during construction to observe whether 'management trigger ' levels are exceeded and to determine the effectiveness of the environmental management methods; and c) In the event that management trigger levels are exceeded during or post-construction an Adaptive Management approach shall be ~~enlisted~~ undertaken in consultation with GWRC that will ~~seek to~~: i. Investigate a plausible cause-effect association with the Project; should the event be linked to the project the following steps will be undertaken: A. Identify the on-site practice that is generating the effect; B. ~~Seek to a~~Alter the operational measure in consultation with GWRC; C. Undertake further monitoring to assess the effectiveness of the altered on-site practice to remedy Project-related effects;
	D. In the event that changes to operational actions are unsuccessful, in consultation with GWRC agree appropriate remedial actions and necessary consenting requirements to manage effects; E. In the event that remedial actions are unsuccessful, in consultation with GWRC agree appropriate mitigation actions and necessary consenting requirements to mitigate effects; F. Undertake further monitoring to assess the effectiveness of the mitigation measures; ii. If the management trigger level exceedance developed in clause a) above is not deemed by a suitably qualified and experienced ecologist to be attributable to works associated with the Project, the consent holder shall not be held liable for any remediation or mitigation works; iii. Management trigger level exceedences during construction should be treated as management triggers ~~and not compliance triggers~~ in the first instance.
G.41	In order to avoid, remedy and mitigate ~~minimise~~ the extent of effects on any area of ~~natural~~ indigenous vegetation and on habitats of indigenous flora and fauna located within the designation, the Consent Holder shall engage a suitably qualified ecologist to prepare detailed maps identifying all those areas listed in (c) and (d) below and other indigenous habitats not identified as high value, including areas of wetland, with information

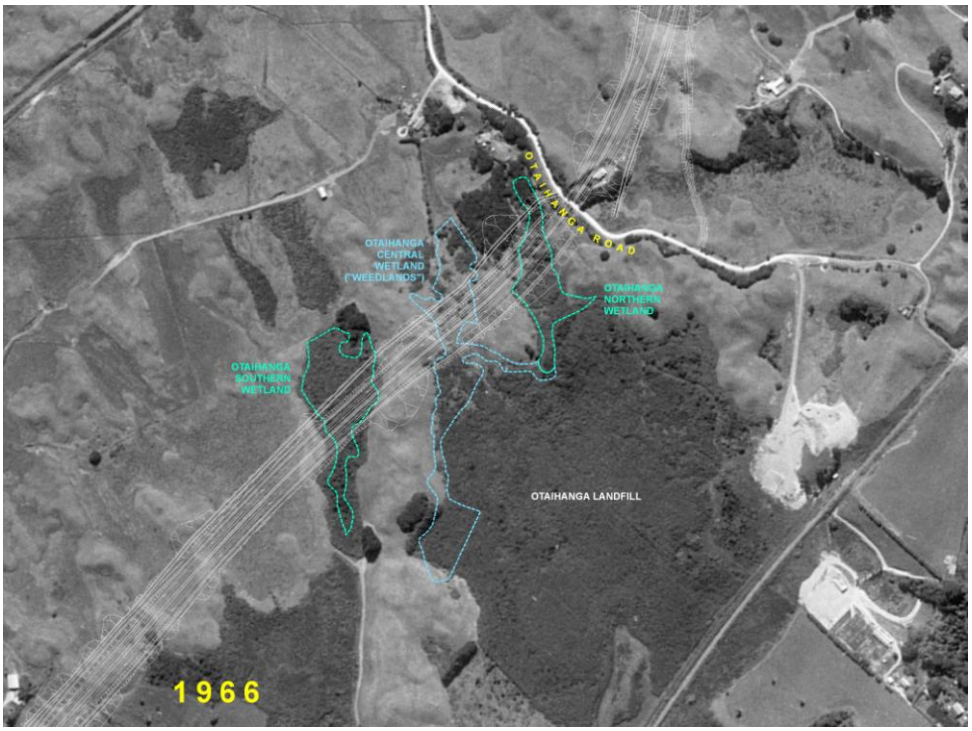
Reference	Wording of Draft Conditions
	on their relative values and protection requirements. The maps shall be completed as part of detailed design and shall be used to inform staff and contractors of the following: ~~inform:~~ a) The ecological implications (including mitigation and consenting requirements) of any ~~Any~~ design change that results in the extent of works varying from the footprint provided in the application drawings; and b) The purpose and mechanisms for ensuring the p~~P~~rotection of sites of ecological value during construction. For the purposes of this condition, areas of natural vegetation and habitats of indigenous flora and fauna are: c) Valued terrestrial vegetation and habitats: 1. Kanuka forest and mahoe south of Raumati Road; 2. Mahoe vegetation along Drain 7; 3. Dry vegetation in Otaihanga; 4. Kanuka remnant in Otaihanga; 5. Riparian vegetation; 6. Riverside plantings; 7. Waikanae River riparian vegetation; 8. Large area of regenerating broad leaved low forest of Tuku Rakau Forest ~~Village~~; 9. Large area of regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Smithfield Road; and 10. Kakariki Stream and associated riparian vegetation. d) Valued wetland vegetation and habitats: 1. Raumati Manuka Wetland; 2. Northern and Southern Otaihanga Wetlands; 3. Otaihanga Central Wetland and associated Landfill Drain; 4. New wetland created to mitigate permanent loss of wetlands; 5. El Rancho Wetland (Weggery); 6. Tuku Rakau Village wetland and regenerating mahoe forest; 7. Te Harakeke/Kawakahia wetland; 8. Kawakahia swamp forest; 9. Ti Kouka Wetland; and 10. Ngarara Wetland. ~~e)~~ The extent of adverse effects shall be minimised by, as a minimum: 1. Developing detailed designs which avoid or minimise the extent of effect on areas identified under (c) and (d above as far as practicable 2. Developing mechanisms to ensure that the areas, or parts of areas, to be avoided are clearly marked on the ground (e.g.

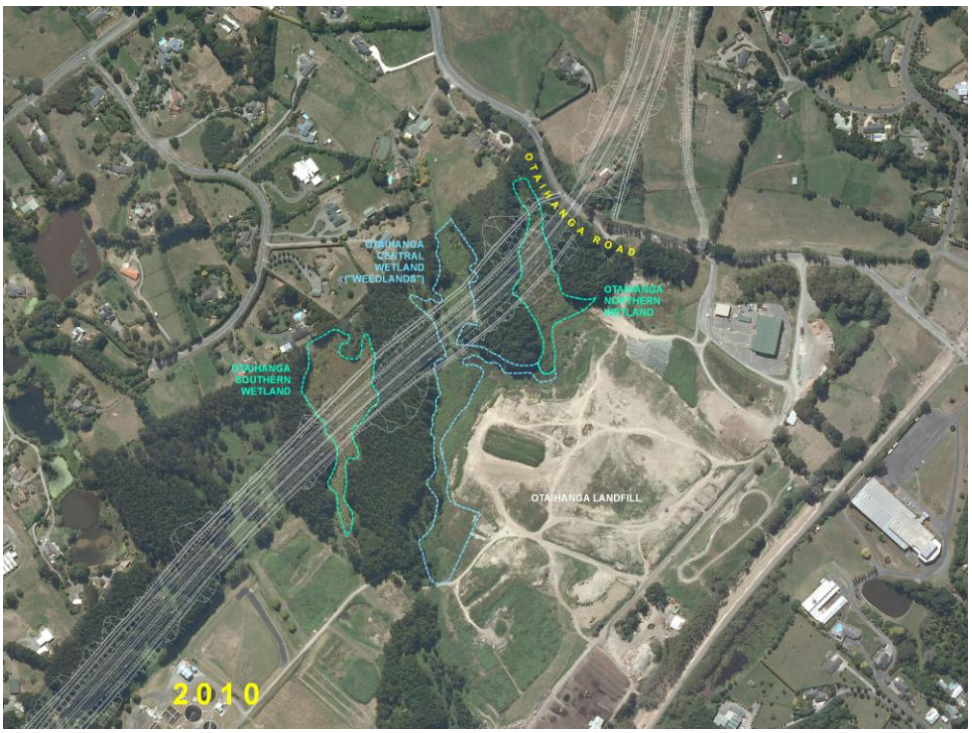
Reference	Wording of Draft Conditions
	through fences) and that contractors are required to avoid them; and 3. For those areas which cannot be avoided, but where complete loss of the ecosystem, vegetation or habitat is not required, developing mechanisms to reduce the impact on the area as far as practicable.
G.42	The Consent Holder shall ~~undertake works necessary to~~ ensure that a combined total of at least 161 ha of land is dedicated to the ~~active or passive~~ restoration of vegetation, wetlands and streams for the purposes of landscape and ecological mitigation. For ecological mitigation, this shall ~~be comprised of~~ comprise the following ~~components~~: a) Approximately 7.6 ha ~~comprising~~ of planted indigenous ~~revegetation of~~ terrestrial habitat: b) Approximately 5.4 ha ~~comprising~~ landscaped and planted indigenous ~~formation and revegetation of~~ wetland habitat; and ~~c) Approximately 17.7 ha comprising planting of riparian habitat;~~ c)~~d) Within the above areas, at least~~ 5.240 linear metres of stream mitigation including naturalisation of channels and 17.7 ha of enrichment of riparian habitat and enhancement of fish passage. For landscape and visual mitigation, this shall be comprised of the following components: a) Approximately 49.6 ha ~~comprising~~ of planted indigenous ~~revegetation of~~ terrestrial habitat; b) Approximately 15. 7 ha landscaped and planted indigenous ~~formation and revegetation of~~ wetland habitat (including flood storage areas and stormwater treatment wetlands); c) Approximately 65.6 ha comprising landscape treatments including grass medians, specimen trees, visual screening. These areas shall closely correspond to the maps entitled Plan Set 11 "Landscape and Visual": and Plan Set (]XXX "Proposed Ecological Mitigation Sites" unless otherwise agreed with the Manager. For each ecological mitigation area, a site specific ecological management plan will be developed by suitably qualified ecologist.
G.43	The final operational designation area shall fully incorporate the above areas of ecological mitigation (with the exception of the riparian mitigation in the Kakariki Stream, which is outside the designation and is to be protected through Certificate of Title mechanisms) to ensure that these ecological mitigation works will continue to function and be able to be maintained on an on-going basis by the consent holder. The mechanisms to achieve ongoing protection of the above ecological mitigation areas shall be set out within the EMP and shall as a minimum cover: a) The felling, removal, burning or taking of any native trees, shrubs or plants or native fauna; b) The planting of trees, shrubs or plants with a preference for

Reference	Wording of Draft Conditions
	specimens sourced from the ecological district within which the land is situated; c) The introduction of any noxious substance or substance otherwise injurious to plant life except in the control of pests; d) The installation and maintenance of fences and gates, except when the provisions of the Fencing Act 1978 apply; e) The control of deer, goats, pigs, and weeds to levels that are necessary to achieve the conditions imposed on the relevant designation and associated consents, and to prevent significant loss of existing natural values; f) Compliance with the provisions of, and any notices given under the Biosecurity Act 1993 and the Wild Animal Control Act 1977; and g) Timing of inspection and reporting requirements.

ANNEXURE E – AERIAL PHOTOS OF OTAIHANGA WETLANDS 1967 AND 2010

(Source: New Zealand Aerial Mapping O/N: 25783; Survey Number: 3022; Flying Date: 5 Apr 1966; Original Neg Scale: 1:67000).





ANNEXURE F – EXAMPLES OF INDIGENOUS PLANTED WETLANDS USED FOR FLOOD STORAGE AND WATER QUALITY TREATMENT

The following photos are of Waiatarua wetland in Remuera, Auckland, a wetland area used for flood storage, WQ treatment, and undergoing continuous restoration activities following the establishment of level controls at the outlet. Photos taken in December 2010.

ANNEXURE G – STAKEHOLDER MEETINGS

Meetings with Department of Conservation

- Conversations on mud fish sampling, rare plants, potential habitat values, bats – typically with Richard Gill (Kāpiti Area Office).
- Various updates to Kris Erikson and Richard Gill following ecological investigations, mudfish surveys, wetland surveys and botanical surveys.
- DOC Wellington Regional Team (including Rob Stone, Richard Gill, Kris Erikson) for briefing on alignment and DOC's position (16 Feb 2011).
- Briefing with DoC (Kris Erikson, Richard Gill and others) MacKays to Pekapeka Expressway (Alliance Team) at M2PP on 26 May 2011.
- Alliance Management Meeting with DOC (no ecological representation).
- Project update meeting on ecology with Richard Gill from DOC at BML offices on 15 Feb 2012.
- Department of Conservation (National Office) staff full update meeting on the Project prior to the submission period on 6 Jun 2012.

Meetings with KCDC

- Various KCDC biodiversity staff involved as Alliance partners through Project shaping process, MCA and associated workshops, matters relating to ecological and hydrological interface.
- Initial project briefings with KCDC officers, mostly Rob Cross.
- Full day site visit with Rob Cross, Matt Aitchison and Alliance hydrology, ecology and ground water teams on 28 Feb 2011.
- Water Quality Session with Alliance and Kapiti Coast District Council staff (Rob Cross and Matt Aitchison) at KCDC chambers on 16 Mar 2011.
- Alliance "Greater" Stormwater Design Review with KCDC staff (Rob Cross, Matt Aitchison and others) and GWRC at KCDC Chambers on 31 March 2011.
- Meeting at KCDC re: landscape and ecology matters (with Rob Cross and landscape architect) on 8 April 2012.
- Meeting at KCDC (Rob Cross and landscape architect) with Boyden Evans to discuss wetlands and planting on 6 May 2011.
- Puriri Road - Kauri Rd Site Visit with Matt Aitchison (KCDC) and Iain Smith (Alliance) on 10 June 2011.
- Stormwater update and design freeze meeting between Alliance and KCDC (Matt Aitchison) on 19 July 2011 at M2PP offices.
- Meeting on fernbird with Rob Cross and Jane Gunn (KCDC) at Project office on 22 Sep 2011.
- Discussion of Smithfield Road options with KCDC (Rob Cross, Jane Gunn, Matt Aitchison) at KCDC on 19 Oct 2011.
- Streams meeting on ecological mitigation (Alliance) and M2PP TOC process (with Rob Cross, Matt Aitchison and Jane Gunn) at KCDC on 7 Jun 2012.
- Sharing of botanical species lists and other ecological survey results.

- In addition to these meetings, there were numerous discussions on opportunities for ecological mitigation (Oxidation Ponds), areas of ecological value, fernbird findings.
- KCDC biodiversity staff were also present at a number of option evaluation workshops.

Meetings with GWRC

- Initial briefing meeting with Alliance Discipline Leaders to discuss the Project on 16 Mar 2011 at GWRC offices.
- Stormwater meeting at KCDC with KCDC and GWRC staff and Project ecology, hydrology and landscape experts, including a site visits to Waikanae River and other waterbodies.
- Full Alliance Team Presentation to GWRC Management and Planning Team on M2PP on 19 Mar 2012 at GWRC offices.
- GWRC (Tim Park) assisted with wetland condition monitoring and botanical survey in key wetlands along the alignment.

Combined (DOC, GWRC and KCDC):

- Meeting on ecological mitigation with Kris Erikson, Richard Gill (apology), Tim Park and Rob Cross at Project office on 14 July 2011.
- KCDC and GWRC also had opportunity to review and provide comment on the ecological assessments and technical reports prior to lodgement with EPA.

QEII National Trust

- Project briefing, including update on ecological matters – on 15 December 2010.

Nga Manu

- First ecological update meeting with Peter MacKenzie and Bruce Benseman on 9 December 2010 at Nga Manu.
- Full Alliance team meeting on 19 Jan 2011 (Noel, Iain, Anna, MCP) at Nga Manu with Peter MacKenzie and Bruce Benseman.
- Full Alliance team meeting (Noel, Iain, Anna, MCP) with Bruce Benseman on 27 July 2011 at Nga Manu.

Takamore Trust

- Introductory meeting with Alliance Team on options on 16 Mar 2011 at Whakarongotai Marae.
- Kaumatua Committee meeting with key discipline leaders on 6 April 2011 at Whakarongotai Marae.

Friends of Waikanae River

- Meeting with Friends of Waikanae River with Boyden Evans and on eco, landscape and hydrology matters at Leybourne Ave on 15 July 2011.