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 evidence of **Stephen Fuller** (Ecological Mitigation, Environmental Management and Monitoring) for the NZ Transport Agency

Dated: 5 September 2012

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STATEMENT OF EVIDENCE OF STEPHEN FULLER FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

1 My full name is Stephen Andrew Fuller.

2 I am an Associate Director and Principal Ecologist with Boffa Miskell Limited (*BML*). I am a generalist ecologist working in a range of fields including the mapping and description of terrestrial flora and fauna, freshwater habitat analysis and monitoring, and avifauna studies. I work primarily in the Wellington region but have carried out assessments throughout the North Island.

3 I have worked as an ecologist over much of the last 28 years, including employment with the Department of Lands and Survey and Botany Division DSIR, when I conducted biological surveys of scenic reserves in the lower and central North Island. From 1992 to 1997 I ran my own ecological consultancy. From 1997 to 2002 I was the general manager of the Karori Wildlife Sanctuary. In November 2002 I joined BML.

4 I hold a Bachelor of Science in Zoology and Botany, and a Diploma of Applied Science in Ecology from Victoria University of Wellington. I am a Certified Environmental Practitioner with the Environment Institute of Australia and New Zealand and am bound by the Institute's code of ethics.

5 My professional memberships include:

(a) The Environment Institute of Australia and New Zealand;

(b) The New Zealand Ecological Society; and

(c) The Wellington Botanical Society.

6 During my time practicing as an applied ecologist I have undertaken a wide range of ecological assessments which have ranged in scale from single property developments through to major infrastructure projects. My work often requires working collaboratively with urban planners, engineers, and landscape designers to integrate community services, physical works, and public open space with protection of significant natural areas, rare and threatened flora and fauna, the creation of conservation corridors, and the sensitive treatment of stormwater.

7 My relevant experience includes:

7.1 I have conducted scoping studies and assessments of ecological effects for a number of roading projects in the Wellington region including assessments for the Transmission Gully designation and consents (1997 and 2012), the Eastern Porirua Roading Study

(1994), the Pukerua Bay Bypass Study (1994), the State Highway 1 (*SH1*) Rural Upgrade (completed in 2002), the Mana Bridge duplication (completed in November 2003), SH1 Mana Esplanade Upgrade (completed in November 2005), the Western Corridor Transportation Study (2004), and the Westchester Link Road (under construction).

7.2 More recently in 2008, I was lead ecologist during the Scheme Assessment Review of Transmission Gully carried out for the NZ Transport Agency (*NZTA*), and from 2009 to 2012 I led the ecology team responsible for ecological assessments of the preferred alignment and the Board of Inquiry process.

7.3 On the Kāpiti Coast I have been involved in a number of projects including effects assessments and appearing as expert witness at Council hearings for Plan Change 63 - Paetawa Road; Plan Change 90 - Paraparaumu Airport; and Plan Change 80 - Ngarara Farm. I have also developed a management plan for El Rancho wetland.

7.4 At a regional level, in 2007 I was responsible for the ecological component of a review of coastal sites of regional significance, carried out for Greater Wellington Regional Council (*GWRC*). Following this, in 2011, I was responsible for the delineation and assessment of significance of wetlands of the Wellington Region. These inventories covered all wetlands and coastal areas potentially affected by this project and informed some of the decisions made during project design.

8 This evidence is given in support of the Notice of Requirement (*NoR)* and applications for resource consent lodged with the Environmental Protection Authority by the NZTA for the construction, maintenance and operation of the Project.

9 I am familiar with the area that the Project covers and the State highway and local roading network in the vicinity of the Project.

10 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. I understand that I have a duty to assist the Board of Inquiry impartially on relevant matters within my area of expertise and that I am not an advocate for the party which has engaged me. My qualifications as an expert are set out above. Except where I state that I am relying on the evidence of another person, I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

11 My evidence draws together the various strands of the five ecological assessments (freshwater, marine, avifauna, herpetofauna, terrestrial vegetation and habitats) to summarise the recommended mitigation, and describes the Environmental Management Plan (*EMP)* and construction processes that will require ecological involvement and adaptive management. In summary my evidence will cover:

11.1 Executive summary;

11.2 Summary of changes since lodgement;

11.3 Summary of the Project's ecological context;

11.4 Summary of Project shaping;

11.5 Summary of potential ecological effects;

11.6 Discussion of mitigation proposals and calculations;

11.7 Discussion of environmental management plans, monitoring and the use of adaptive management;

11.8 Discussion of the proposed consent conditions;

11.9 Response to s149G Key Issues Reports; and

11.10 Response to submissions relating to mitigation and monitoring.

EXECUTIVE SUMMARY

12 I was involved in the design of study methodology for the multiple ecological disciplines involved and I reviewed all of the ecological assessments.

13 Overall, I believe I have a comprehensive understanding of the ecology of the Project Study area, the physical effects that construction of the route is likely to have on the local ecology, and the efforts that have been made to accurately identify and minimise these ecological impacts.

14 The Project shaping process has resulted in the avoidance of almost all areas of vegetation and habitat of indigenous fauna that would, in my opinion, be considered ecologically significant and which were at risk under the Western Link Road designation. Overall, the proposed Project is, in my view, a considerable improvement from an ecological stand point over any option which is constrained to the existing Western Link Road designation.

15 Some vegetation communities and habitats of low to moderate ecological value could not be practically avoided due to property and other constraints. Where this has occurred I believe all reasonable efforts have been made to minimise the extent of loss. Proposed conditions of consent are included in the application that will support this objective.

16 Where sites with ecological value will be lost or modified, the scale of adverse effect has been quantified and appropriate levels of mitigation have been determined based on the value of each site. I have assisted with developing the mitigation for these areas and believe that the mitigation proposed for these adverse effects is sufficient and appropriate.

17 I also note that substantial areas of revegetation are proposed for landscape and visual mitigation and for stormwater treatment and flood storage purposes. While these areas have not been included in the calculations for ecological mitigation, I believe this planting will provide additional ecological benefits and if combined with the restoration required to mitigate for ecological effects, will provide a long term net ecological gain.

18 There still remains a need to monitor a number of areas of indigenous vegetation and habitat for indigenous fauna during construction to ensure protection or minimisation of potential effects. There is also a need for ecological input to the implementation of a range of works to ensure remedial activity is carried out as required and to ensure works required as part of identified mitigation achieve the levels of ecological benefit required. Proposed conditions of consent are included in the application that will support this objective.

19 For some aspects of construction works varying levels of adaptive management have been proposed, which includes ecological involvement in decision making where changes to design are required, unexpected effects are observed, management triggers are exceeded, or current levels of information on effects are inadequate and require monitoring. In my view, adaptive management is an appropriate tool for construction projects of this scale.

20 I consider that there are three areas of uncertainty where the risk of adverse effects cannot be sufficiently determined in advance of the proposed works. They are:

20.1 Risk of sediment discharge to significant ecological sites (Waikanae Estuary and Te Harakeke/Kawakahia wetland) during construction;

20.2 Risk of construction related changes to wetland hydrology at several sites; and

20.3 Risk of construction and operational effects on North Island fernbird, a nationally threatened species.

21 As a result, baseline, construction and post-construction monitoring of each of these matters are required, and adaptive management responses will need to be developed in the event that adverse effects are identified. Proposed conditions of consent are included in the application that will support this objective.

22 I have reviewed the submissions lodged on the Project relevant to my areas of expertise. Nothing raised in those submissions causes me to depart from the conclusions reached in my technical assessment of the Project.

BACKGROUND AND ROLE

23 My role in the Project has included assistance with development of the ecological study methodologies. I was the reviewer for the Terrestrial Vegetation (Technical Report 27), Freshwater (Technical Report 30), Avifauna (Technical Report 29) Reports[1] and the draft Ecological Management Plan (*EMP*).[2] I was also a co-author of the Ecological Impact Assessment (*EIA*) (Technical Report 26), and I have reviewed the evidence that relates to these reports.

24 I was consulted by **Mr Park**, **Dr Bull**, and **Dr Keesing** when mitigation options were being developed and I also prepared jointly with **Dr Keesing**, the Baseline Freshwater Monitoring Plan which is attached to **Dr Keesing's** evidence.[3] I have also assisted with ecological input into the location and design of a number of the ecological, landscape and visual and stormwater and hydrology mitigation and planting areas.

CHANGES SINCE LODGEMENT

25 Since lodgement of the application with the EPA, there have been a number of further design activities and ongoing consultation with Kāpiti Coast District Council *(KCDC)* and GWRC that have led to refinements or modifications to ecological mitigation locations and extent as follows.

New information

26 Since lodgement it has come to our (the ecology team's) attention that several small areas of stream works were not included in our freshwater analysis. This means that the total length of stream works has increased from approximately 2.9 km to 3.1 km. As a consequence, the total length of freshwater mitigation required has increased from

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1 Technical Reports are contained in AEE, Volume 3.

2 Appendix M to the Construction Environmental Management Plan (*CEMP*), AEE, Volume 4.

3 Refer to evidence of **Dr Keesing** (Annexure D).

approximately 4.9 km to 5.2 km. We have therefore needed to identify additional sites for mitigation to meet the shortfall.[4]

Consultation over stream mitigation

27 The identification of sites for stream mitigation has relied on our understanding of the availability of a number of lengths of stream within the designation. Ongoing consultation with KCDC has identified issues with the availability of several lengths of stream due to KCDC and GWRC's ongoing requirements for flood management and associated maintenance. We have therefore needed to locate alternative sites of equivalent restoration potential.[5]

Mitigation maps

28 As a result of changes described above, and ongoing discussions within the Project team, we have refined the proposed mitigation areas and treatments. A new set of maps is attached to the evidence of **Dr Keesing**.[6]

Key Issues Reports

29 The ecology team has given additional consideration to several issues highlighted in the Councils' Key Issues Reports. We have responded to KCDC and GWRC directly on a number of these matters and specific response to the issues raised are also set out in our evidence, in particular in the evidence of **Dr Keesing** and **Mr Park**.

Pre-construction baseline monitoring

30 Since lodgement, we have prepared two baseline monitoring plans and commenced surveys. The purpose of these studies is to help determine triggers for requiring adaptive management, and to provide sufficient pre-construction data on species and habitats to allow comparisons during and post construction. The baseline plans are:

30.1 A baseline monitoring plan for freshwater and marine fauna and habitats. This plan has been presented to GWRC for their consideration. We have commenced some aspects of the baseline sampling.[7]

30.2 A baseline monitoring plan for North Island fernbird.[8] This plan has been discussed with the Department of Conservation (*DoC*), and sampling has commenced.

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4 Refer to evidence of **Dr Keesing**.

5 Refer to evidence of **Dr Keesing**.

6 Refer to evidence of **Dr Keesing** (Annexure C). Note that these locations of stream restoration replace those shown in Maps 10 a to 10 d of Technical Report 26.

7 Refer to evidence of **Dr Keesing** (Annexure D).

8 Refer to evidence of **Dr Bull** (Annexure B).

31 Completion of the EMP[9] (as described in proposed condition G.34 to G.37), ongoing construction monitoring (proposed condition G.38 to G.39), and potential adaptive management (proposed conditions G.40) will rely on the results of these baseline studies.

32 Specifically this data will contribute to completion of sections 4.4 (Freshwater Ecology Monitoring) and sections 4.5 (Marine Ecology Monitoring) of the EMP.

33 The draft EMP does not currently include a section on monitoring of fernbird. Following completion of the baseline study, a section on fernbird monitoring will be included.[10]

Fernbird Study

34 Recent results from the ongoing baseline study of North Island fernbird have provided confidence that this subspecies will not be affected by traffic noise and activity, and that a sustainable population of this subspecies can exist adjacent to a road if good habitat is available.

35 However, predicted habitat loss during construction still requires mitigation, and the population still requires monitoring during and post construction to ensure the mitigation effectively replaces and enhances habitat for this population. Dr Bull is satisfied that the proposed monitoring and mitigation are appropriate.[11]

Summary

36 Overall, the changes described above do not change in any material way the ecology team's conclusions, as set out in the EIA, regarding the successful achievement of appropriate levels of mitigation and the net positive effects that are anticipated as a result of the Project.

THE EXISTING ENVIRONMENT

Historical context

37 The ecological historical context is described in Section 5.1 of Technical Report 26 and Section 3 of Technical Report 27, and relevant aspects are also summarised in the evidence of **Dr Keesing** (freshwater), **Dr Bull** (avifauna), **Dr De Luca** (coastal) and **Mr Park** (terrestrial). The following is a broad overview encompassing all of these.

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[9] A draft EMP was provided with the application (Appendix M of the Construction Environmental Management Plan (*CEMP*)).

[10] Refer to evidence of **Dr Bull.**

[11] Refer to evidence of **Dr Bull**.

38 The Project is proposed through flat to rolling sand country contained entirely within the Foxton Ecological District (ED 31.02).[12]

39 This ecological district is one of the more modified in the Ecological Region.[13] Historically, the area traversed by the Project was part of a wetland system called "The Great Swamp" (Carkeek 1840).[14] This was an extensive dune, lake, and swamp complex connected by a network of waterways, both streams and ephemeral wetlands. Early descriptions suggest it was an extremely complex system of wetlands, waterways and permanent and ephemeral lagoons, lakes, ponds, and pools of varying sizes, shapes, and depths.[15]

40 The Great Swamp lay between the foredunes of the Kāpiti Coast and the toe of the eastern hills; extended from the Manawatu River to Paekakariki, and covered an area of over 9,200 ha (Fuller 1992).

41 Interspersed within these extensive wetlands were areas of semi swamp forest and spines of dry forest that established on stabilised dunes and gravel fans to either side of the larger waterways such as the Waikanae River.[16]

42 A number of streams and small rivers crossed these wetlands from the ranges to the east. They were highly convoluted waterways, being seasonally swallowed as lakes and lagoons swelled with winter rains, and meandering by way of constantly changing routes through the dynamic coastal dunes.

43 Along the coastline, each stream and river discharged to the ocean by way of a dynamic sandbars, lagoons and estuaries that pushed through the foredunes and were in a constant state of destruction and renewal following storms.

Today

44 The Great Swamp has been subject to 150 years of drainage and peat "management". Today less than 300 hectares remains of the Great Swamp (or approximately 3%) and most, though not all, of the indigenous forest and wetland remnants are highly modified by farming and urbanisation. Several regionally significant wetlands including Te

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[12] An ecological district is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities (Park et al., 1983).

[13] An Ecological Region is "An aggregation of adjacent ecological districts with very closely related characteristics together form an ecological region. In some cases, a single very distinctive ecological district is given the status of ecological region to emphasise its uniqueness's (Park et al., 1983).

[14] References are detailed at the end of my evidence.

[15] Technical Report 27, Section 3.5, Figure 5.

[16] Technical Report 27, Section 3.7.1, Map 6 and Table 2.

Harakeke/Kawakahia Wetland, the largest remnant of the Great Swamp, lie within or in close proximity to the proposed Project.

45 The conversion of the Kāpiti district to farms in the 1800s removed almost all terrestrial vegetation which had covered the dry dune country, together with many of the native species of fauna that relied on these habitats. With the exception of a few scattered and isolated areas of remnant forest, most of the areas of native vegetation visible today have regenerated in areas where farming has declined.[17] It has been estimated that less than 5% of the indigenous vegetation that would have once occurred in the Ecological District remains. Of that, approximately half is protected.[18]

46 Indigenous fauna in these areas are typically limited to hardy and relatively cosmopolitan species such as fantail and grey warbler although immigration from Kāpiti Island and the eastern hills is increasing diversity of avifauna.[19] As many as five species of indigenous lizard may be present in the Ecological District, though only one species was found by the studies undertaken as part of this Project.[20]

47 During conversion to farms and associated residential subdivision, many of the original streams traversed by the Project had almost all of their natural meanders and wetlands removed and placed in straight, highly incised channels for ease of management and to improve flood capacity. In addition, a large number of new waterbodies (drains) were formed to drain the swamp, many of which have been retained to minimise flooding in low lying areas. Most of these waterbodies are subject to regular "destructive" maintenance by KCDC, GWRC and landowners to remove build-ups of aquatic weeds and sediments, and so manage flood risk. The ongoing and regular nature of these activities significantly affects the ecological values of these waterways. The only relatively natural streams remaining within those catchments potentially affected by the Project are the lower meanders of the Whareroa and Kakariki Streams, which have avoided channelisation and retain some natural character.[21]

48 The Waikanae Estuary and the other stream mouths potentially affected by the Project have been "frozen" through ongoing management to minimise their movement and protect coastal properties. Only the Whareroa and Kakariki Streams and, to a limited extent, the Waikanae River retain a natural stream to ocean connection.[22]

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17 Technical Report 27, Section 3.7.2, Map 7 and Table 3.

18 Technical Report 26, Section 6.3, Map 7 and Maps 8a to 8d.

19 Technical Report 26, Section 5.3.

20 Technical Report 26, Section 5.4.

21 Technical Report 26, Section 5.6, Map 4.

22 Technical Report 26, Section 5.7, Map 5, and Annexure C in the evidence of **Dr De Luca**.

49 In addition to the impact on streams, wetlands and estuaries of vegetation clearance and physical modification, all waterbodies that were assessed along the Project alignment currently suffer from water quality issues to a greater or lesser extent due to either rural discharges, or the effect of urbanisation.[23] Urban contamination includes stormwater discharges from roads, residential proprieties and commercial sites, and discharges from landfills and waste water treatment plants.

50 Because of the extent of loss and modification of indigenous vegetation and habitats within the Foxton Ecological District, those fragments of earlier forest, streams and estuaries that remain are important - and any area that provides habitat for indigenous fauna, natural or otherwise, is valued. The Land Environments of New Zealand (LENZ) threat status for the land over which the Project crosses is 'Acutely Threatened'.[24]

51 The EIA combines the descriptions and assessments from each of the ecological Technical Reports discussed earlier. Chapter 6 of the EIA (Technical Report 26) summarises our determinations of ecological value of each identified site, plant community, stream, important species of flora and fauna and their associated habitats.

Project Extent

52 The Project traverses five catchments, the Whareroa, Wharemauku, Waikanae, Kakariki, and Kowhai/Hadfield. The combined area of these catchments is 10,808 ha.

53 The Project footprint, that is the estimated area of the physical footprint, is 164 ha. It sits within a designation of 316 ha.

54 The designation lies largely within pasture, rank grass or weedlands dominated by gorse and blackberry (55%). A further 18% is in plantation pine or exotic treelands such as willow or macrocarpa.

55 Less than 4% or 6.25 ha of the footprint is dominated by indigenous plant communities. Pioneer shrublands, scrub and low forest make up the majority of the indigenous vegetation. Small areas of wetland make up the remainder. There is no remnant forest within the designation.[25]

SUMMARY OF PROJECT SHAPING

56 Project shaping is described in detail in Section 7 of Technical Report 26, and in the evidence of **Mr Park**. The focus of this process for the ecology team was avoidance of identified areas of ecological value.

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[23] Technical Report 24, Baseline Water and Sediment Quality Investigation.

[24] Technical Report 26, Section 6.2, Map 6.

[25] Technical Report 26 Section 5.2, Table 11.

57 A number of key decisions regarding the Project alignment were made with consideration of the need to try and avoid specific sites of high to very high ecological value, including the southern margin of Te Harakeke/Kawakahia Wetland, the Ti Kouka Wetland, Ngarara Wetland, the south eastern margin of El Rancho wetland (and the other El Rancho wetlands), and Poplar Avenue wetland. If the Project had impacted on these systems, mitigation would have been difficult to achieve.

58 Through the shaping process:

58.1 Most terrestrial vegetation of high ecological value has been avoided. Those areas that have not been avoided all comprise regenerating scrub and low forest (mahoe and kanuka). In my opinion, mitigation for the loss of these regenerating vegetation communities is straightforward. Because of the relative youth and generally low biological diversity of the affected vegetation, there will not be a significant lag in mitigation planting achieving equivalent benefits.

58.2 Ten wetlands of high ecological value that were located within the Western Link Road designation have been physically avoided by the Project.[26] Those wetlands that have not been avoided are all highly modified and are of medium ecological value. Their loss can, in my opinion, be sufficiently mitigated in a manner that reflects their modified nature.

59 Overall, Project shaping has led to a designation and Project footprint that has significantly less adverse ecological effects than the current Western Link Road designation. With the exception of streams, direct and indirect effects are now limited to a number of isolated sites of small extent and low relative value. In my view, this is a significant improvement for the route.

SUMMARY OF ECOLOGICAL EFFECTS

60 In this section of my evidence I will summarise the various ecological effects of the Project.

Habitats

Streams (habitat loss)

61 A number of sites or habitats could not be physically avoided. The most significant of these relates to the need to cross 15 perennial waterways. The total length of affected waterway is 3,120 m of which 1,123 m will

[26] Poplar Avenue Wetlands; Raumati South Peatlands; the majority of the Raumati Manuka Wetland; El Rancho Wetland (West); El Rancho Wetland (Takamore); Osbourne Swamp West wetland; Osbourne's Swamp (QEII covenant); Kawakahia/Te Harakeke Wetland (QE II covenant); Ti Kouka wetland (QEII covenant); and Ngarara Wetland east of Ngarara Road.

be lost to culverts, 1,525 m to diversions, and 472 m will be affected by channel stabilisation (e.g. riprap) associated with bridge formation.[27]

62 Even though the waterways traversed by the Project are typically highly modified, with most being of low or very low relative value, the degree of habitat loss proposed is at a scale that requires fairly comprehensive mitigation. The quantum of mitigation was calculated using the Stream Ecological Valuation (*SEV*) model and I am confident the final mitigation value is appropriate. The SEV model and the quantum of mitigation are discussed in the evidence of **Dr Keesing.**

Terrestrial Vegetation and Wetlands

63 Only very small areas of terrestrial vegetation will be lost (3.8 ha), all of which is seral scrub and young forest regenerating from pasture. For transparency, we have used a simple multiplier to calculate mitigation for this terrestrial vegetation loss[28] and I am satisfied that the mitigation calculated is appropriate.

64 Only four wetlands of medium ecological value will be directly affected by the revised alignment. These wetlands have been highly modified by past land use activities as well as being affected by invasive weeds. For two of these wetlands (Raumati Manuka Wetland and El Rancho Wetland - Weggery), the Project will result in the loss of a small portion of the edge of the wetland vegetation. The other two, Northern Otaihanga and Southern Otaihanga, will be more extensively affected. As for terrestrial vegetation, we have used a simple multiplier to calculate mitigation for this loss and I am satisfied that the mitigation calculated is appropriate.[29]

65 Of more concern is the potential risk of changes to wetland hydrology caused by changes to sub-surface flows, ponding and drying associated with the Project. Based on the groundwater modelling undertaken,[30] potential effects could extend some distance from the Project and affect wetlands that are otherwise avoided by the physical alignment. This issue has been discussed at length within the Project team and modelling has been carried out to try and quantify potential effects. Baseline monitoring has also commenced, with piezometers being installed in a number of wetlands located in close proximity to the proposed alignment (or deemed to be potentially at risk). An adaptive management regime is required in the event that changes are measured that can be directly attributed to formation of the new roading alignment and this is incorporated in the proposed consent conditions.

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[27] Technical Report 26 Section 8.1.2, Table 28.

[28] Refer to evidence of **Mr Park**.

[29] Technical Report 26, Section 8.1.1, Table 26.

[30] Refer Technical Report 21 (Assessment of Groundwater Effects).

Ms Williams has proposed additional conditions in her evidence to ensure that this is carried out.[31]

Indigenous fauna

Birds

66 Because of the general paucity of quality indigenous bird habitat along the proposed alignment, there are few species of birds of concern that have been identified.[32]

67 Several species which are at risk or threatened were observed adjacent to or traversing the site (pied shag, black shag) or are known from habitat near the Project (bittern). Only one threatened species, North Island fernbird (At Risk) was seen within the proposed alignment.

68 The impact of formation of a road on wetland bird species is considered to be low given the wetlands themselves are avoided. The exception to this is the North Island fernbird. The risk to fernbird of habitat loss is uncertain and additional study has commenced to quantify this risk.[33]

Lizards

69 The lizard surveys carried out for this study only recorded one species, the common skink, out of the five native species that could be present based on habitat availability.[34] While lizards are very difficult to survey due to their cryptic behaviour, this result suggests that either the other lizard species are absent (due to loss of habitat through vegetation clearance and a long history of intensive farming) or are present at such low levels that any standard sampling effort is unlikely to record them. The ecology team's conclusion is that any effects will be low and readily mitigated through the proposed habitat creation. However, some pre-construction lizard rescue is recommended at El Rancho Wetland.[35]

Sediment Discharge

70 During construction a quantity of sediment will discharge to streams, some of which will be transported to the Waikanae Estuary and the smaller stream mouths[36] downstream of the Project.

Streams

71 In most streams it will be difficult to determine what effect, if any, these sediment discharges will have to streams. This is due to their general poor health, the levels of destructive management that is carried out routinely in many of these channels for flood management, and the

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[31] Refer to evidence of **Ms Williams**.

[32] Refer to evidence of **Dr Bull**.

[33] Refer to evidence of **Dr Bull**.

[34] Technical Report 28 (Herpetofauna)

[35] Refer to evidence of **Mr Park**.

[36] Technical Report 26, Section 8.2.4, Table 39.

highly tolerant fauna typically found in these channels as a result. Therefore, the only concern is to significant sites downstream of works. These include wetlands and estuaries.[37]

Wetlands

72 Only one wetland could potentially be affected by significant discharges of sediment, the Te Harakeke/Kawakahia Wetland which lies downstream of an extensive area of earthworks in the Ngarara, Kakariki and Paetawa streams catchments.

73 Given the scale of erosion and sediment control proposed and the sand, silt and peat-substrates, adverse effects may not occur in this wetland. However, given this wetland's high ecological significance, ongoing monitoring is recommended through construction as well as managed responses in the event that adverse effects are identified.[38]

Waikanae Estuary and the smaller stream mouths

74 The only potential adverse effects during construction on the Waikanae Estuary and the smaller stream mouths are through discharge of sediment. Of the five stream mouths that lie downstream of the Project, only the Waikanae Estuary has both high ecological values and a relatively stable estuary that could be affected by discharges. The other smaller stream mouths are all high energy environments that flush directly to sea and are unlikely to be affected by sediment or discharges.[39]

75 During the construction phase, the risk of a sediment discharge of a scale that will have a measurable adverse effect on the Waikanae Estuary is considered low based on the modelling undertaken[40] and the fauna present. However, given the ecological significance of this estuary, monitoring is recommended through construction as well as managed responses in the event that adverse effects are identified.[41]

Stormwater Discharge

76 During road operation the modelling carried out by Beca suggests that movement of existing SH1 traffic to the proposed Expressway, combined with the scale of stormwater run-off treatment proposed, will reduce the levels of contaminants entering these waterways and so will result in a positive outcome.[42]

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37 This is discussed in the evidence of **Dr Keesing**.

38 Refer to evidence of **Mr Park**.

39 Refer to evidence of **Dr de Luca**.

40 Refer to evidence of **Mr Ridley**, and CEMP Appendix H: Erosion and Sediment Control Plan.

41 Refer to evidence of **Dr de Luca** and is provided for in the monitoring plan set out as Annexure C of **Dr Keesing's** evidence.

42 Technical Report 25 (Contaminant Load Assessment).

CALCULATION OF ECOLOGICAL MITIGATION REQUIREMENTS

77 Mitigation is proposed for the loss of freshwater, wetland, and terrestrial habitat.

Stream Habitat Loss and Modification

78 For the loss of freshwater habitat, the SEV model has been used to calculate an ecological compensation ratio. The SEV tool is the only tool developed in New Zealand that in my view is appropriate for calculating stream mitigation and it has been used extensively in the upper North Island. It is a tool that has been formally adopted by the GWRC who require that practitioners seeking to use it must carry out appropriate training, which the Wellington BML team has done.[43]

79 I am satisfied that the use of the SEV tool is appropriate for this Project, that the BML staff who used it have the appropriate level of training and expertise in the model, and that the model has produced an appropriate level of mitigation for this Project. This tool was used for the Transmission Gully project and was accepted by the Board of Inquiry in that case.[44]

80 The outputs of this tool are covered in detail in the evidence of **Dr Keesing**.

Terrestrial vegetation and wetland loss and modification

81 There is no accepted tool for calculating mitigation requirements for the clearance of indigenous vegetation in New Zealand and international tools are not appropriate, although tools are in development. We have therefore used a simple multiplier to determine the extent of revegetation required to mitigate for terrestrial habitat loss.[45]

82 The multiplier acknowledges that there is a time lag between clearance of vegetation and its replacement through revegetation, and that some vegetation takes longer to be replaced than others. We have used the following ratios:

83 For seral (regenerating) kanuka or mahoe broadleaf forest, twenty to forty years will be needed for a canopy to form and so a scale up of 2 for 1 has been applied.

84 For wetlands, it is very difficult to match lost habitat at one site through restoration at another site due to the underlying substrates and hydrological conditions, and the difficulty of establishing many wetland

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[43] Technical Report 26, Section 11.3.

[44] Final Report and Decision of the Board of Inquiry into the Transmission Gully Proposal (June 2012), Volume 1, Paragraphs 486, 491, 496-497, and 504.

[45] Technical Report 26, Section 11.1 and 11.2.

species. Typically, relatively simple wetland ecology can be formed in relatively short time, but it takes many years for the full wetland complexity and species diversity to establish. For this reason a scale up of 3 for 1 has been applied.

85 If remnant forest was being affected, several centuries would be required for recovery and a larger scale up would be applied. However, all remnant forest has been avoided during the Project shaping process.

86 This approach was used for the Transmission Gully project and was accepted by the Board of Inquiry.[46]

Assessment of residual effects following mitigation

87 It is my opinion that all adverse effects identified by the ecological assessments can be fully mitigated within the proposed designation and no additional offsetting is required, with three caveats:

87.1 There remains a small risk of a damaging sediment discharge to Waikanae Estuary and the Te Harakeke wetland.

87.2 There is uncertainty about effects on the North Island fernbird.[47]

87.3 There remains uncertainty about potential hydrological effects on several wetlands of high value.[48]

88 Specific monitoring relating to the matters identified above is required to determine if adverse effects have occurred during construction or longer term as a result of the road's operation. This is provided for in consent conditions and by way of EMP development as discussed below.

89 If adverse effects are shown to have occurred, the adaptive management process described in proposed conditions G.40, and which will be further defined in the EMP (proposed conditions G.34 to G.39), will come into play to ensure compliance.

Potential positive effects/ ecological benefits

90 While the primary focus of any evidence so far has been on adverse effects of the Project, overall the ecology team's assessments conclude that with the mitigation proposed most adverse effects will be short term, and in the medium to long-term such effects will become neutral.

91 I note that this conclusion does not take into account the considerable additional areas of re-vegetation that are proposed to assist in landscape

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[46] Final Report and Decision of the Board of Inquiry into the Transmission Gully Proposal (June 2012), Volume 1, Paragraphs 449 to 452, and 453 to 464.

[47] Technical Report 26, Section 12, Table 53.

[48] Technical Report 26, Section 11.4.

and visual mitigation, and which are proposed for the formation of stormwater treatment wetlands and planted flood storage areas.

92 The revegetation that we have determined is necessary to mitigate for loss of terrestrial and wetland habitat amounts to a minimum of 7.6 ha of terrestrial planting and 5.4 ha of wetland development and revegetation. In addition, the 5,246 m of stream restoration will require 17.7 ha of riparian planting. This gives a total of 30.7 ha of planting required for ecological mitigation.

93 The indigenous planting that is proposed for landscape and stormwater purposes will provide an additional 49.6 ha of terrestrial vegetation and 15.7 ha of wetland vegetation (flood storage and stormwater treatment); a total of 65.3 ha.

94 This additional planting will be carried out using indigenous species and will be planted in a way that is identical to requirements for ecological mitigation planting.[49] This planting will result in a general increase in indigenous habitat diversity and extent along the alignment. Therefore, when added to the required ecological mitigation, it will provide a significant ecological benefit.

ENVIRONMENTAL MANAGEMENT PLANS AND ADAPTIVE MANAGEMENT REGIME

95 The proposed consent conditions require preparation of various management plans, and provide guidance on what the plans are to cover and the standards that need to be achieved.

Ecological Management Plan (EMP)

96 The Construction Environment Management Plan (*CEMP*) is the primary plan to be used to manage construction effects. As discussed by **Mr Robert Schofield**, the CEMP includes a number of specific management plans as appendices, including the EMP.

97 The development of this suite of plans is normal for projects of this scale. These plans respond to the critical and sometimes unique environmental issues identified through the AEE process, and provide a framework for delivery on the consent conditions. In particular they identify in detail the tools and methods that are to be used to manage environmental issues, identify which require pre-during and post construction monitoring, describe the compliance reporting, and provide a set of monitoring triggers that force a management response, for instance through adaptive management.

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[49] See proposed conditions DC.57 (e) vi. and DC.57(i) which relate to the Landscape Management Plan.

98 Each of the recommended mitigation measures described in the EIA is picked up and elaborated in the draft EMP (Appendix M of the CEMP) to extent possible prior to completion of baseline studies. The EMP includes the following sections:

98.1 A summary of all valued ecological components, potential adverse effects, and proposed mitigation (Section 2);

98.2 A general approach to management and protection of each ecological component during construction (Section 3);

98.3 A description of the monitoring that is required for each ecological component (Section 4); and

98.4 A series of appendices with locations of significant sites, locations of mitigation areas, and indicative restoration plans.

99 As lodged the EMP is still very much in draft form. Further information will be gathered during detailed design and from baseline studies that will refine this Plan and provide more specific measures and targets where required. This is normal practice and the process of completing and gaining approvals for the final EMP is detailed in consent conditions as follows:

99.1 Proposed consent condition G.34 provides for this further refinement before the EMP is submitted to GWRC for certification.

99.2 Proposed condition G.35 requires the EMP be prepared by a suitably qualified ecologist.

99.3 Proposed condition G.36 requires coordination between the EMP and the Landscape Management Plan (*LMP*) as all revegetation will be carried out under the LMP.

99.4 Proposed condition G.37 also requires consultation with the KCDC prior to lodging this Plan with GWRC for certification.

Adaptive Management

100 The EMP sets out an adaptive management programme consistent with that proposed in the EIA that will allow the results of baseline studies, construction, and post construction monitoring to inform construction and operational management decisions.

101 The evidence of **Mr Schofield** discusses the concept of adaptive management under the RMA generally. However, from an ecological perspective, an adaptive management process recognises that complex ecological systems are inherently unpredictable, but that gathering information during a period of change and establishing trends is the best way to improve understanding and confidence in predictions. Adaptive management recognises that:

101.1 It can be difficult and sometimes impossible to predict with certainty the exact scale or precise duration of an ecological effect in a complex system with multiple environmental variables operating;

101.2 Further, it can be difficult and sometimes impossible to predict with certainty if a planned mitigation tool will deliver within a specific timeframe, or to a desired or required standard;

101.3 The act of monitoring, carried out as part of an adaptive management process, almost always provides additional information that can improve predictions, refine mitigation methods, and inform a process of continuous improvement. This increases certainty over time and allows for real time responses to un-expected or unpredictable events; and

101.4 Entering into a complex restoration project with all parties expecting to be part of an adaptive management process can lead to improved collaboration and communication, which also leads to improved environmental outcomes.

102 The key to an adaptive management process is the establishment of agreed triggers and a clear process and agreed responsibilities for response to unexpected events.

103 For this Project, adaptive management will be used to respond to potential ecological effects on vegetation, wetlands, freshwater, and marine habitats. Specifically adaptive management for this Project will need to:

103.1 Seek continual improvements in the management of sediment and erosion control devices, with a focus on Te Harakeke wetland, and Waikanae Estuary;

103.2 Develop and monitor an appropriate response in the event monitoring identifies changes in local hydrology which are adversely affecting wetlands;

103.3 Develop and monitor an appropriate response in the event monitoring determines mitigation requirements for wetlands, streams and terrestrial revegetation are not achieved; and

103.4 Develop and monitor an appropriate response in the event monitoring identifies adverse effects on North Island fernbird.

104 The monitoring methods and triggers for commencing an adaptive management process will be determined through baseline monitoring

which is underway, and are required to be included in the EMP for certification by GWRC before construction starts.[50]

PROPOSED CONSENT CONDITIONS

105 A number of proposed consent conditions relate to monitoring and management of effects on terrestrial flora, fauna and habitats, and freshwater and marine systems. Those conditions that relate to specific ecological components are described in detail in the evidence of **Dr Keesing, Dr Bull, Dr de Luca** and **Mr Park**.

106 The conditions I discuss below are set out as **Annexure A** to my evidence.

107 By way of a broad overview, the conditions specifically dealing with ecological matters are those that relate to the EMP (G.34 to G.40). In accordance with the proposed conditions, the EMP will describe:

107.1 The methods and activities necessary to protect or minimise effects, and will describe in detail how each element of permanent mitigation will be carried out (G.34 to G.37);

107.2 How the works will be monitored, what will be monitored and by what methods, and what compliance reporting is required (G.38 to G.39); and

107.3 Where adaptive management shall be used to respond to uncertainty of ecological effects, the events that will be monitored and the triggers for an adaptive management response (G.40).

108 In addition, a number of conditions require coordination between ecologists and other disciplines where construction activities may have adverse ecological effects, including:

108.1 Wetland reclamation and vegetation clearance and in particular identification of habitats where there is currently agreement to retain, and involvement in decisions where changes to earthwork extent may require additional clearance (proposed conditions DC.57 and G.34 (c) (i), and (iii);

108.2 Coordination between the LMP and the EMP is of particular importance as all revegetation activities will fall into the LMP including revegetation of areas required for ecological mitigation. It is normal practice for landscape architects to manage this process in consultation with the project ecologists (proposed conditions DC.54, (d) (vi), DC.55 (b), and DC.58);

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[50] As set out in the proposed conditions G.38 to G.40.

108.3 Identification, notification and response to incidents and in particular those that trigger adverse ecological effects on waterways (proposed conditions G.9, G.10);

108.4 Staff training with regard to education of construction staff about species and habitats of value, and processes for unexpected finds, e.g. mudfish (proposed condition G.11);

108.5 Development of the over-arching CEMP and the interactions between the CEMP and EMP (which is an appendix of the CEMP (proposed conditions G.15 to G.26);

108.6 Development of the Erosion and Sediment Control Plan and in particular coordinated monitoring the performance of capture and treatment devices (proposed conditions G.27, G.28, and E.8. to E.10), and monitoring of aquatic habitat downstream of discharge points (proposed condition E.9);

108.7 Development of a Groundwater (Level) Management Plan (proposed conditions G.29 to G.30);

108.8 Design and construction of freshwater diversions including implementation of the revegetation and mitigation strategies (proposed conditions WS.1 to WS.8); and

108.9 The installation of bores and water-take and in particular the monitoring of potential adverse effects on streams and wetlands (proposed condition GT.5).

Proposed Changes

109 I am aware of changes proposed to the conditions by the wider ecology team and I support their recommendations. The changes primarily relate to:

109.1 Certainty over quantum and location of mitigation areas[51];

109.2 Identification of valued sites[52];

109.3 Long term protection and management of mitigation sites; and

109.4 Additional detail on groundwater effects on wetlands[53].

Mitigation Areas and Valued Sites

110 With regard to the first three matters, similar concerns were raised during the Transmission Gully hearings and a number of conditions were

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[51] Refer to evidence of **Dr Keesing**.

[52] Refer to evidence of **Dr Keesing**.

[53] Refer to evidence of **Mr Park**.

developed through the hearing to address them. I recommend that a similar approach be used for this Project and provide three additional conditions in **Annexure A**. These conditions provide:

110.1 A new condition G.41 that lists, or refers to a schedule of, valued sites that are to be retained, or are sites where effects are required to be managed and minimised;

110.2 A new condition G.42 which states the final quantum of ecological and landscape planting required as mitigation; and

110.3 A new condition G.43 that identifies the minimum requirements for ongoing protection and management of all mitigation sites.

111 I also recommend that plans be prepared showing proposed Mitigation Sites and Treatments,[54] and that reference to these plans be included in conditions DC.1 and G.1 (as shown in **Annexure A**).

Groundwater (Level) Management Plan

112 The proposed consent conditions for groundwater monitoring as lodged do not provide a clear link between monitoring of groundwater and monitoring of wetland health, although this link is more clearly provided in the proposed Groundwater (Level) Management Plan.[55]

113 I understand that several proposed conditions were inadvertently omitted from the application as lodged. This is discussed in the evidence of **Ms Williams** and updated conditions are provided.[56] I am happy with these additional conditions.

RESPONSE TO SECTION 149G(3) KEY ISSUES REPORTS

114 The GWRC Key Issues Report raised a number of issues relating to ecology. Most of these issues are dealt with in the evidence of **Dr Keesing**, **Dr De Luca** and **Mr Park**. However I will address the issues raised around the EMP and the proposed consent conditions.

115 Section 7.5 of the GWRC Report notes that the proposed consent conditions rely on a series of management plans for management of construction, monitoring, reporting, and effects identification; and that this is consistent with GWRC general approach to large projects (paragraph 226).

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[54] These plans have yet to be finalised but will be provided with the rebuttal evidence.

[55] CEMP Appendix I, Groundwater (Level) Management Plan. Section 1.4 (Relevant Environmental Plans); Section 5.2 (Monitoring of Water Levels in Wetlands), Appendix D (Ecological Adaptive Management).

[56] Refer to evidence of **Ms Williams**, Annexure B: Proposed Consent Conditions, specifically Condition GD.5.

116 The GWRC Report identifies that the proposed environmental management requirements rely on the use of an adaptive management approach (at paragraph 227). The GWRC Report then raises a concern that the draft plans (i.e. the CEMP and its appendices, including the EMP) lodged with the application lack detail such as quantifiable triggers, thresholds and contingencies (paragraph 228).

117 I agree generally with their conclusions, as the draft EMP in particular requires additional detail in a number of areas. However, as discussed earlier in my evidence, much of the detail that GWRC seeks cannot be supplied until detailed design has been completed and baseline monitoring has been carried out. This is normal practice, as is the requirement for consent conditions which have been proposed, and which identify what the final EMP needs to contain, who needs to be consulted and when it needs to be submitted for certification.

118 In particular, detailed design will determine the details of stream works and ecological wetland formation upon which to base final planting plans, any associated restoration plans, any requirements for monitoring and any monitoring triggers.

119 The baseline monitoring proposed has been designed to collect all remaining data necessary to allow for pre and post construction comparisons. This programme will inform the development of a construction monitoring plan for certification by GWRC, and will collect sufficient data for the development of appropriate management triggers.

120 In terms of the GWRC's concerns regarding the "adaptive management" approach proposed, I consider adaptive management is unlikely to include fixed solutions to anticipated problems. Therefore, while some contingency options can be developed, there is a reasonable likelihood that other anticipated issues will need to be resolved with stakeholders through this process and potentially post-construction of the route.

121 I would anticipate that, while it is not a requirement, there will be ongoing consultation with relevant GWRC staff through the process of completing the EMP, including joint site visits, the submitting of drafts for review and responding to feedback. This also is normal practice.

RESPONSE TO SUBMISSIONS

122 I have reviewed those submissions that identify ecological issues as a reason for support or opposition. A large number simply state they oppose the Project because of ecological effects without providing further or supporting detail, and I do not discuss these further.

123 A number of submissions relate to specific ecological components (streams, lizards, vegetation, birds) and these are discussed in the evidence of **Mr Park, Dr Keesing**, **Dr Bull** and **Dr De Luca**.

124 The submissions I consider below are those that raise issues relating to the definition of the coastal environment, mitigation and offsetting, adequacy of mitigation, construction management plans including monitoring, adaptive management, and integration with other plans, and legal protection of mitigation areas. I discuss submissions under these broad headings.

The Coastal Environment

125 In its submission, KCDC suggests that the Expressway lies within the coastal environment and seeks the following:

> *"There needs to be an assessment of the proposal in the context of the New Zealand Coastal Policy Statement and the coastal environment, followed by conditions requiring any alterations to the Proposal that are necessary as a result of that assessment".* [57]

126 I note that KCDC is basing its opinion regarding the extent of the coastal environment on a recent study[58] which has not been developed into policy or guidance, and which could not have been considered during development of the AEE.

127 **Mr Evans** discusses this issue in his evidence in terms of landscape and natural character. I will comment on it from an ecological perspective.

128 I share Mr Evans' view that KCDC is incorrect in its interpretation of extent of the coastal environment.

129 To put this statement into context, all of New Zealand is subject to oceanic influences, from its beaches to the summits of our central ranges. The New Zealand Coastal Policy Statement (*NZCPS)* however, identifies that the coastal environment includes:

> "*areas where coastal processes, influences or qualities **are significant**, including coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands, and the margins of these*". [my emphasis][59]

130 In an ecological context, "coastal processes" covers matters such as active dunelands, coastal erosion and accumulation, storm surges, tidal flows, salt spray, and so on. This influence diminishes as you move inland until a point is reached where coastal influences cease to dominate and are overridden by other environmental factors. At this point vegetation and habitat grade into lowland communities.

131 There is not always a sharp boundary between coastal and lowland, particularly on flat landscapes like the Kāpiti Coast. However, in the

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[57] Submission 682 at paragraph 219.

[58] Kapiti Coast District, Coastal Environmental Study, Draft Report V2, August 2011.

[59] New Zealand Coastal Policy Statement 2010 (NZCPS); Policy 1, (2), (c).

absence of agreed guidance, and in the context of indigenous vegetation and habitats, I believe it is logical to use the same approach to defining the coastal environment as the RMA uses to define wetlands. That is, the flora and fauna are dominated by species and communities that are obligate to, or preferentially inhabit, environments which are dominated by coastal influences. For this Project, there are no habitats or communities within the proposed designation that meet this criterion.

132 For example:

132.1 None of the wetlands potentially affected are dominated by plant species which are obligate to saline or brackish water such as estuaries or coastal dune slacks.

132.2 None of the streams located within the proposed designation are tidal or contain saltmarsh vegetation.

132.3 None of the fish communities observed within the proposed designation were dominated by coastal species (e.g. flounder, mullet, and kahawai). Few of the macro-invertebrates found in these streams would survive in saline or brackish water.

132.4 Those areas of indigenous terrestrial vegetation within the proposed designation are dominating by seral forests of mahoe or kanuka. While these two species can be found in coastal environments, the forests that will eventually evolve into will, in my opinion, be more correctly described as lowland.

132.5 The avifauna recorded within the proposed designation is predominantly pastoral with a variety of waterfowl and cryptic waders in and around the freshwater wetlands. While many of these species can be found in coastal environments such as dunelands and estuarine saltmarsh, none of them are predominantly coastal. All are found widely within lowland end montane habitats throughout New Zealand.

133 It could be argued that any sediment generated by the Project will eventually end up in the coastal environment and that this discharge must be assessed against the NZCPS. However, if this approach was to be applied to this project, then it would also need to be applied to any activity seeking consent that generates and discharges sediment to any river in New Zealand irrespective of proximity to the coast.

134 For completeness, I also note that DOC's submission[60] states that the NZCPS "may" apply. For the reasons stated above, I do not consider that it does.

Mitigation and Offsetting

135 KCDC questions the quantum of calculated mitigation for the Project as it considers that:

135.1 The value of wetlands and vegetation have been downplayed along the route; and

135.2 Best practice has not been applied in calculating offset ratios.[61]

136 With regard to the first item, **Mr Park** described the process for assessing significance in his evidence. I have discussed his assessments throughout the development of Technical Report 27 and the AEE, and am in full agreement with the conclusions of his assessment.

137 With regard to the second item, KCDC seeks the following:

> *"The utilisation of a biodiversity offsetting model to calculate the level of mitigation required."*
>
> *"An offset ratio of at least double that proposed within the AEE for wetlands and bush."*[62]

138 An accepted model for the calculation of stream mitigation (SEV) was used, as discussed by **Dr Keesing** in his evidence and earlier in my evidence (paragraphs 78 to 80). The SEV method is required by GWRC, and its use was accepted by the Board of Inquiry for Transmission Gully.

139 However, there is as of yet no accepted model for calculating the quantum of mitigation (or biodiversity offsetting) for terrestrial vegetation loss in New Zealand. There are some experimental models being trialled through DOC's 'Biodiversity Offsetting Project' and which we have had some experience with, but these models have a number of significant limitations and for this reason we do not use them. This is an area of emerging science and through our involvement in DOC's Biodiversity Offsetting Project we understand there will be better guidance in the near future.

140 In the meantime, we have applied the same approach to calculation of appropriate mitigation for loss of terrestrial habitat and wetlands as we

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[60] Submitter 0468, page 3, section C. I also note that GWRC (Submitter 684), responsible for administering the Regional Coastal Plan, is silent on this matter/has not raised this issue.

[61] Submission 682 at paragraphs 21 to 28.

[62] Submission 682 at paragraph 29.

applied for the Transmission Gully Project. I believe the quantums that are proposed are sufficient and discuss this in more detail below. I note GWRC's Key Issues Report[63] sought that the approach for calculating mitigation be consistent with the TGP decision as a minimum.

141 On 22 August 2012, the GWRC produced a without prejudice "Discussion Document" to provide further detail on the matters raised in its submission. In this Document, section 9, GWRC felt the location, quantum and means of protection of mitigation sites was not clear. I believe that my evidence and that of **Dr Keesing** and **Mr Park** address this concern.

Adequacy of Mitigation

142 A number of submissions state that the proposed ecological mitigation is not adequate, or that the adverse effects are of such a scale that they cannot be mitigated.[64]

143 Overall I would note that while the Project footprint is 164 ha, project shaping has resulted in avoidance of all but 5.6 ha of indigenous vegetation and wetland habitat.

144 Ecological mitigation for this loss will comprise a range of activities including a total 30.8 ha of planting. The planting will restore or recreate a range of habitats for fauna (birds and lizards), and will support a number of stream restoration and wetland development projects. I believe this level of mitigation is entirely appropriate.

145 If ecological mitigation is considered alongside indigenous planting that will be carried out in other areas along the alignment for landscape and flood storage purposes, the combined area of indigenous habitat that will be created along the Project alignment will be 96 ha. This is over 15 times the area of indigenous habitat loss. For this reason, it is my view that not only will effects be mitigated, but there will be a net ecological benefit. I therefore disagree with submissions that mitigation is not adequate.

146 I would also note that in my experience this is a very easy site to carry out the range of required mitigation that is proposed; flat and rolling ground, permeable sandy soils, shallow water table, and an excellent growing climate. The main issue will be managing weed growth until plants are properly established.[65] In this environment the mitigation being proposed is straightforward and does not require unique or

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[63] GWRC Key Issues Report at paragraph 217.

[64] Refer for example Submissions 251 [MR Mansfield], 327 [Saxby & Moutier], Submission 656 [Ms Carter], 707 [Raumati South Residents Association], and Submission 682 [KCDC].

[65] This matter is addressed in the draft EMP and is discussed in more detail in the evidence of **Mr Evans**.

innovative treatments. I therefore disagree with any suggestions that the required levels of mitigation cannot be achieved.

Legal protection of mitigation areas

147 KCDC seeks conditions which require legal protection of mitigation areas.[66]

148 Almost all mitigation areas lie within the designation and will be retained by NZTA. Therefore, with appropriate management I am comfortable that they will be protected in the long term. I agree, however, with KCDC to the extent that the proposed conditions could be more explicit regarding ongoing management of these sites. I discuss this above (paragraph 110), and propose additional conditions to give greater effect to long term management (**Annexure A**, proposed conditions G.41 – G.43).

149 Two mitigation sites lie outside the designation. Firstly, the Waikanae Oxidation ponds are under KCDC's management and mitigation will be carried out in accordance with an existing management plan.[67] I do not believe additional protection is needed. Secondly, a small section of Kakariki Stream lies outside the designation, but is on land owned by NZTA. Protection of this section of stream should be a straightforward matter.

Construction Management Plans

150 Several submissions noted a lack of detailed solutions in the management plans.[68] I discuss this earlier in my evidence (paragraphs 96 to 99 and paragraphs 115 to 121). I am confident that the appropriate process is being followed for the development of these plans and that consent conditions will ensure the issues of concern to submitters are appropriately considered.

Monitoring

151 The DOC seeks greater monitoring of wetland hydrology, and a greater duration of monitoring than the 3 years that is currently contained in the draft document – up to at least five years. Greater monitoring of wetland hydrology is also a matter raised by a number of other submitters, including KCDC.[69]

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66 Submission at paragraphs 42 and 43.

67 This is discussed in the evidence of **Mr Park**.

68 For example, Submitter 0733 [Ms J Svendsen], Submitter, 0309 [Ms Pomare], Submitter, 0468 [Department of Conservation] and Submitter 0682 [KCDC].

69 Submitter 0477 [Waikanae Christian Holiday Park Inc] and Submitter 0682 [KCDC].

152 **Ms Williams** addresses this matter in her evidence and has recommended inclusion of additional conditions.[70] I support her conclusions and the proposed conditions.

153 I also note that KCDC must be consulted during development of the EMP where this monitoring will be developed.[71]

Adaptive Management

154 One submitter had concerns about the adaptive management approach suggesting there is no track record.[72] I understand the desire for greater certainty, however, I have worked on a number of projects where adaptive management was part of the construction monitoring and management programme, and have seen it work effectively to improve systems (in particular for sediment management).

155 I note that DOC supports the use of adaptive management, but seeks the formation of an independent advisory panel to review and advise on various matters including plan preparation and compliance monitoring. I respectfully suggest that, with the exception of potential effects on wetlands due to impacts on groundwater, all activities that will be monitored use standard and accepted methodologies and do not require greater oversight than would be provided by the Councils. In the event that effects on wetlands of groundwater change are identified, some innovative solutions may be needed as outlined in the Groundwater (Level) Management Plan. However, where Councils do not have sufficient expertise to advise on an activity, they can, and regularly do, employ independent experts to assist them. I do not believe an external independent panel is necessary for this Project. This is also discussed in **Mr Park's** evidence.

Integration between EMP and GWMP

156 KCDC seeks greater integration between the Ground Water Management Plan and the Ecological Management Plan.[73] I support this as discussed earlier (paragraphs 112 to 113).

Planted flood storage area and wetland health

157 Several submitters raise concerns regarding potential stagnation of flood storage areas and stormwater treatment wetlands.[74] These are valid concerns, and there is a history of failed ponds on the Kāpiti Coast. As a result, in 2005 I was commissioned by GWRC to produce a guidance document which dealt with these potential issues (BML 2005).

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[70] See evidence of **Ms Williams**, Annexure B.

[71] See proposed condition G.37.

[72] Submitter 0309 [Ms Pomare].

[73] Submission 682 at paragraph 60.

[74] For example, Submitter 0675 [Dr M O'Sullivan], Submitter 725 [Mrs Palmer].

Invariably the failed ponds were poorly designed and received little or no maintenance.

158 I am confident that with good design and a commitment by NZTA to appropriate ongoing management, the ponds will continue to be healthy and the issues of odour, insect pests, and weediness can be addressed. Integration between construction, landscape design and ecology is covered by proposed conditions.[75]

Waikanae River Banks

159 The ecology team did not recommend use of the Waikanae River for mitigation as we understand that flood management and erosion control are GWRC's over-riding concerns. There would be limited opportunity for indigenous revegetation given these constraints.

160 I note that The Friends of the Waikanae River[76] are seeking the removal of poplars from the river bank and, in response, GWRC Operations may consider use of native species in combination with willows.[77]

161 GWRC's main criterion for 'proposed trees' is that they have good root growth. There is considerable recent research on the excellent rooting depth and strength of native riparian plants and we would strongly support any agreement to introduce native species into the GWRC riparian planting programme at the Waikanae River and other waterbodies as appropriate.

162 While we are comfortable with the level of mitigation proposed, we support this initiative by the Friends of Waikanae River to see a mix of indigenous species included in the erosion protection planting on the Waikanae River.

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Stephen Fuller
5 September 2012

[75] See proposed condition DC.54; Landscape Management Plan.

[76] Submitter [0059].

[77] GWRC Discussion Document, 22 August 2012, page 4, 5th paragraph, 3rd bullet.

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ANNEXURE A: PROPOSED CONDITIONS DISCUSSED IN MY STATEMENT OF EVIDENCE [78]

PROPOSED DESIGNATION CONDITIONS[79]

Reference	Draft conditions
	General Conditions and Administration
DC.1	a) Except as modified by the conditions below, and subject to final design, the Project shall be undertaken in general accordance with the information provided by the Requiring Authority in the Notice of Requirement dated [insert date] and supporting documents being: 1. Assessment of Environmental Effects report, dated [insert date] 2. Plan sets: 1. CV-SP -100 – 160: Scheme plans; 2. CV-GP-101-136: Geometric plans; 3. CV-SC-001-004: Cross sections; 4. CV-EW-100-232: Earthworks; 5. CV-BR-100-970: Bridges; 6. CV-GE-100-140: Structural - General; 7. GI-PR-01-18: Land Requirement Plans; 8. CV-MF-100-132: Lighting, Marking and Signage; 9. CV-CM-101-412: Construction Methodology; 10. Urban & Landscape Design Framework (Technical Report 5); 11. Landscape & Visual (Technical Report 7)- Appendix A & B; 12. Stormwater & Hydrology (Technical Report 22) – Appendix 22.A; 13. Erosion & Sediment Control (CEMP Appendix H) – Appendix H.B, H.C, H.D, H.E, H.F, H.H, H.I, H.R. 14. Proposed Mitigation Sites and Treatments (Plan Set XXX). b) For the avoidance of doubt, none of these conditions prevent or apply to works required for the ongoing operation or maintenance of the Project following construction such as changes to street furniture or signage over time. Depending upon the nature of such works, outline plans or outline plan waivers may be required. c) Where there is conflict between the documents listed above and these conditions, these conditions shall prevail.

[78] Redlining (i.e. ~~strikethrough~~ and underlining) shows changes proposed to the conditions as lodged.

[79] AEE, Chapter 32.

PROPOSED RESOURCE CONSENT CONDITIONS[80]

Reference	Wording of Draft Conditions
	General
G.1	The Project shall be undertaken in general accordance with the plans and information submitted with the application as documented as consent numbers [INSERT GWRC REFERENCE NUMBERS HERE], subject to such amendments as may be required by the following conditions of consent. The plans and information include: a) Assessment of Environmental Effects report, dated [XXXX] April 2012 b) Plan sets: i. CV-SP -100 – 160: Scheme plans; ii. CV-GP-101-136: Geometric plans; iii. CV-SC-001-004: Cross sections; iv. CV-EW-100-232: Earthworks; v. CV-BR-100-970: Bridges; vi. CV-GE-100-140: Structural - General; vii. GI-PR-01-18: Land Requirement Plans; viii. CV-MF-100-132: Lighting, Marking and Signage; ix. CV-CM-101-412: Construction Methodology; x. Urban & Landscape Design Framework (Technical Report 5); xi. Landscape & Visual (Technical Report 7)- Appendix A & B; xii. Stormwater & Hydrology (Technical Report 22) – Appendix 22.A; xiii. Erosion & Sediment Control (CEMP Appendix H) – Appendix H.B, H.C, H.D, H.E, H.F, H.H, H.I, H.R. xiv. Proposed Mitigation Sites and Treatments (Plan Set XXX). Where there is conflict between the documents lodged and the conditions, the conditions shall prevail.
	Incidents
G.9	a) The consent holder shall immediately notify the Manager and the Territorial Authority if any contaminants (including sediment) or material are released in the undertaking of the Work and enters any watercourse due to any of the following: i. discharges from non-stabilised areas that are not treated by erosion and sediment control measures required under this consent; and/or ii. failure of any erosion and sediment control measures; and/or iii. any other incident which either directly or indirectly causes, or is likely to cause, adverse ecological effects in any watercourse that is not authorised by a resource consent held by the consent

[80] AEE, Chapter 33.2.

Reference	Wording of Draft Conditions
	holder. b) If any of these incidents occur, the consent holder shall notify the Manager as soon as practicable after the incident being identified, and shall: i. establish control measures where these have failed or have not been implemented in accordance with the CEMP as soon as practicable; ii. liaise with the Manager to establish what remediation or rehabilitation is required and whether such remediation or rehabilitation is practical to implement; iii. carry out any remedial action as required by and to the satisfaction of the Manager; and iv. maintain a permanent record of the incident at the site, which shall include the date and time of the incident, the nature, manner and cause of the release of the contaminants, weather conditions at the time of the incident and the steps taken to contain any further release and to remedy any adverse ecological effects on the watercourse. c) This notification shall be either by telephone or email, or via an alternative electronic method as agreed with the Manager. d) For the purpose of this condition, 'incident' shall refer to any discharge of contaminants that either directly or indirectly causes, or is likely to cause, adverse ecological effects in any watercourse that is not authorised by a resource consent held by the consent holder.
G.10	a) The consent holder shall, if requested by the Manager in response to a complaint, incident or other reasonable request that relates to managing an adverse effect that is directly related to the construction of the project, carry out a review of any management plan required by these conditions. The consent holder shall submit the reviewed management plan to the Manager for certification that: b) The reason(s) for requiring the review have been appropriately addressed; and c) Appropriate actions and a programme for implementation are provided for if required.
	Staff Training
G.11	The consent holder shall ensure that earthworks contractors responsible for supervising site staff shall undergo environmental awareness training, required by the CEMP. This training shall occur at least five working days week prior to the commencement of any earthworks or earthworks stage and shall be given by a suitably qualified and experienced person certified by the Manager to deliver a practical on-site training session. Specifically, contractors shall be briefed as follows: a) Contractors likely to be involved in the construction and maintenance of

Reference	Wording of Draft Conditions
	erosion and sediment control devices shall receive training on the performance standards to be achieved by the erosion and sediment control devices; and b) Contractors likely to be involved in the construction of any stream diversions or other in-stream works shall be briefed on the values of the stream, the objectives of stream design, the requirements of native fish for fish passage, and the sensitivity of the receiving environment to sediment discharge. c) Contractors likely to be involved in any works involving vegetation clearance shall be briefed on the values of any significant areas of vegetation that are to be retained, and the methods that shall be used to identify and protect them during construction.
	Management Plans - General
G.15	All works shall be carried out in general accordance with the management plans required by these conditions.
G.16	Any changes to management plans specified in Condition G.15 that may be sought by the consent holder shall remain consistent with the overall intent of the relevant management plan and shall be submitted to the Manager for certification at least 10 working days prior to any changes taking effect.
G.17	The management plans may not include all details for every stage of works at the time the plan is submitted for certification to the Manager. If further details are to be provided for later stages of construction, the management plan shall specify which stages require further certification at a later date. Further details shall be submitted to the Manager at least 10 working days prior to works commencing in the relevant construction stage. Any changes to the relevant Management Plan that may be required as a result of further design details shall be submitted to be certified by the Manager at least 10 working days prior to works commencing in the relevant construction stage in accordance with the relevant condition(s). The further details submitted shall be consistent with the original purpose and objectives as outlined in the relevant conditions below.
G.18	Where a management plan is required to be prepared in consultation with any third party, the management plan shall demonstrate how the views of that party (or parties) have been incorporated, and where they have not, the reasons why.
G.19	The management of key environmental effects associated with the construction phase of the Project shall be detailed within 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). This suite of management plans consist of:

Reference	Wording of Draft Conditions
	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
	Construction Environmental Management Plan
G.20	The consent holder shall update and finalise the draft CEMP submitted with the application (dated XX 2012), which shall include the suite of Management Plans listed under condition G.19. The finalised CEMP 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 of the CEMP.
G.21	The certification shall confirm that the CEMP (and its appendices) shall confirm that the CEMP gives effect to the relevant conditions and that includes details of: a) Staff and contractors' responsibilities b) Training requirements for employees, sub-contractors and visitors; c) Environmental incident and emergency management (including the procedures required under condition G.9); d) Communication and interface procedures; e) Environmental complaints management (required under Condition G.8); f) Compliance monitoring; g) Environmental reporting; h) Corrective action; i) Environmental auditing; and j) CEMP review. The CEMP shall also confirm construction methodologies and construction timeframes, including staging.
G.22	The CEMP shall confirm final project details, staging of work, and sufficient engineering design information to ensure that the Project remains within the limits and standards approved under this consent and that the construction activities avoid, remedy or mitigate adverse effects on the environment in accordance with the conditions of this consent. The CEMP shall identify where design information for a particular stage will be

Reference	Wording of Draft Conditions
	submitted at a later stage(s), in accordance with condition G.17.
G.23	At least 15 working days before submitting the CEMP to GWRC for certification the consent holder shall submit a copy of the draft final CEMP required by Condition G.20 to KCDC for comment. Any comments received shall be supplied to the Manager when the CEMP is submitted, along with a clear explanation of where any comments have not been incorporated and the reasons why.
G.24	The CEMP shall be implemented and maintained throughout the entire construction period, and updated if further design information is provided
G.25	A copy of the CEMP shall be held on each construction site at all times and be available for inspection by GWRC.
G.26	If the CEMP (including any of its constituent management plans) required to be revised as a result of any updated or new design information, the changes shall be certified by the Manager in accordance with the relevant condition. The revisions shall be submitted for certification at least 10 working days before the commencement of works in that part of the Project to which the information relates.
	Erosion and Sediment Control Management Plan
G.27	The consent holder shall finalise, submit and implement through the CEMP, an Erosion and Sediment Control Management Plan (ESCP) to be submitted to the Manager for certification at least 15 working days prior to works commencing in accordance with Condition E.1
G.28	The consent holder shall prepare, submit and implement through the CEMP, site specific Construction [stage] Erosion and Sediment Control Plans (CESCP) to be submitted to the Manager for certification at least 5 days prior to work commencing in that site, in accordance with Condition E.2 The CESCP will be consistent and in accordance with the CEMP as required for G.20 and the ESCP as required for G.27 above.
	Groundwater (Level) Management Plan
G.29	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 minimise the effects on groundwater levels. The GWMP shall include information regarding: i. the schedule of groundwater monitoring bores identifying piezometer depth, screen length and geological unit; ii. the locations of groundwater monitoring bores shown on plans; iii. the locations of monitoring stations on the Wharemauku Stream and Drain 5;

Reference	Wording of Draft Conditions
	iv. monitoring frequency; v. monitoring methods; vi. reporting requirements; vii. alert and action programmes; viii. response management; and ix. review procedures.
G.30	At least 15 working days before submitting the GMP to GWRC for certification the consent holder shall submit a copy of the draft GMP required by Condition 0 KCDC for comment. Any comments received shall be supplied to the Manager when the GMP is submitted, along with a clear explanation of where any comments have not been incorporated and the reasons why.
	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 outline the ecological management programme to protect, reduce and remediate impacts on the environment during the construction phase of the Project. This EMP shall also 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. b) 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. c) The EMP shall provide information on how the following outcomes will be achieved: i. Minimise loss of valued vegetation and habitats; ii. Minimise construction effects on freshwater and the marine environments; iii. Minimise effects on identified wetlands resulting from hydrological changes to water tables; 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. Re-establish affected lizard habitat and minimise lizard mortality

Reference	Wording of Draft Conditions
	resulting from construction of the Project; vii. Carry out monitoring in a manner that will confirm that adverse effects are as predicted; any exceedence is identified; and appropriate actions are undertaken to rectify; viii. Ensures that mitigation requirements are undertaken and monitored to ensure success is achieved; ix. Carry out monitoring in a manner that confirms that mitigation meets objectives; and x. The North Island fernbird population is not adversely affected by construction or operation of the Project;[81] and xi. Ensure that in the event of additional vegetation or habitat loss outside of the Project footprint, mitigation calculations are consistent with the Environmental Compensation Ratios outlined in the EMP.[82]
G.35	The EMP shall be prepared by suitably qualified and experienced ecologist, and shall implement the principles and outcomes sought by the Ecological Impact Assessments (Technical Reports 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.
	Ecological Monitoring – General
G.38	Monitoring shall be carried out in accordance with the EMP as required by

[81] Refer to evidence of **Dr Bull**.

[82] Refer to evidence of **Mr Park**.

Reference	Wording of Draft Conditions
	Condition G.34 in order to: a) collect baseline information on vegetation, wetlands, freshwater and marine ecology and fernbird[83] for 1 year prior to construction work starting; b) collect ecological information on vegetation, wetlands, freshwater and marine ecology and fernbird during construction work; c) collect ecological information on vegetation, wetlands, freshwater and marine ecology and fernbird for a minimum of 2 years post construction works completion.
G.39	All ecological monitoring required under the EMP shall be managed 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) submitted to the Manager at quarterly intervals for certification that the appropriate monitoring has been undertaken; c) submitted to the Director-General of Conservation and KCDC for information; and d) summarised and submitted as part of the annual report required under Condition G.14.
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, wetlands, freshwater, distribution of fernbird,[84] and marine habitats in order to develop 'trigger' levels; b) Undertake monitoring during construction to observe whether 'trigger' levels are exceeded and to determine the effectiveness of the environmental management methods; and c) In the event that trigger levels are exceeded an Adaptive Management approach shall be enlisted 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

[83] Refer to evidence of **Dr Bull.**

[84] Refer Evidence **Dr Bull**.

Reference	Wording of Draft Conditions
	undertaken: A. Identify the on-site practice that is generating the effect; B. Seek to alter the operational measure in consultation with GWRC; C. Undertake further monitoring to assess the effectiveness of the altered on-site practice. ii. If the trigger level exceedence is not attributable to works associated with the Project, the consent holder shall not be held liable for any remediation or mitigation works; iii. Trigger level exceedences during construction should be treated as management triggers and not compliance triggers in the first instance.

	Ecological Mitigation
G.41 (new)	In order to minimise 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, with information on their relative values and protection requirements. The maps shall be completed as part of detailed design and shall inform: d) Any design changes that result in the extent of works varying from the footprint provided in the application drawings; and e) Protection of sites during construction. For the purposes of this condition, areas of natural vegetation and habitats of indigenous flora and fauna are: f) Valued terrestrial vegetation and habitats:[85] 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 broadleaved low forest of Tuku Rakau Village; 9. Large area of regenerating broadleaved low forest on Ngarara Farm

[85] CEMP Appendix M – Ecological Management Plan, Section 2.4. Table 2 Valued Vegetation.

	between Te Moana Road and Smithfield Road; and 10. Kakariki Stream and associated riparian vegetation. g) Valued wetland vegetation and habitats:[86] 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; 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. h) 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. 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 (new)	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 the following components; a) Approximately 7.6 ha comprising revegetation of terrestrial habitat; b) Approximately 5.4 ha comprising formation and revegetation of wetland habitat; and c) Approximately 17.7 ha comprising planting of riparian habitat; d) Within the above areas, at least 5,240 linear metres of stream mitigation including naturalisation of channels, enrichment of riparian habitat and enhancement of fish passage. For landscape and visual mitigation, this shall be comprised of the following

[86] CEMP Appendix M – Ecological Management Plan, Section 2.5, Table 3 Wetland by Sectors 1 - 4.

	components: a) Approximately 49.6 ha comprising revegetation of terrestrial habitat; b) Approximately 15.7 ha comprising 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.
G.43 (New)	The mechanisms to achieve ongoing protection of the above 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 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 inspections and reporting on requirements.

PROPOSED CONSENT CONDITIONS FOR EARTHWORKS AND DISCHARGES TO LAND[87]

Reference	Wording of Draft Conditions
	Erosion and Sediment Control Monitoring
E.8	The Consent Holder shall carry out monitoring in accordance with the ESCP and the certified CESCP and which will seek to ensure that: a) The proposed erosion and sediment control measures have been

[87] AEE, Chapter 33.3.

Reference	Wording of Draft Conditions
	installed properly; b) Methodologies are carried out properly; and c) Erosion and sediment control measures are functioning effectively throughout the duration of the project.
E.9	In the event of either a failure of erosion and sediment control devices or where a storm event exceeds the design volume of the device, and where the discharge is to a perennial or intermittent freshwater body, wetland or estuarine/marine environment, a suitably qualified ecologist(s) shall be notified within 24 hours, who shall then inspect the relevant area to determine whether significant adverse effects on the affected area's ecological values have occurred. The Project's Environmental Manager shall prepare a report on the effects of the failure and any recommended measures that may be required to remedy the effects; the report shall be submitted to the Manager for approval within 5 working days of the event. The remedial measures shall be implemented within 10 working days of the approval of the Manager.
E.10	The consent holder shall carry out weekly inspections of all site haul roads in order to ensure they are well maintained and that erosion and sediment control devices remain effective.