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 **Dr Sharon De Luca** (Marine ecology) for the NZ Transport Agency

Dated: 31 August 2012

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STATEMENT OF EVIDENCE OF DR SHARON DE LUCA FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

1 My full name is Dr Sharon Betty De Luca.

2 I hold the qualifications of Bachelor of Science (Zoology) and Doctor of Philosophy (Environmental and Marine Science) from the University of Auckland.

3 I am a Principal and Senior Ecologist with Boffa Miskell Limited (*BML*) specialising in marine ecology, working primarily in the Auckland, Wellington and Bay of Plenty regions. I have been employed by BML for six years. I have previously worked for City University of Hong Kong (as a Post-Doctoral Fellow) on a variety of research projects focussing on coastal ecology, ecotoxicology, marine microbiology and the development of new techniques for monitoring sublethal stress in marine invertebrates.

4 I am a registered member of The Royal Society of New Zealand, the New Zealand Marine Sciences Society and the New Zealand Coastal Society and have practised as an environmental scientist for the past nine years. 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. I have published nine scientific papers in peer reviewed international journals.

5 My relevant experience in marine ecology includes:

5.1 Northshore Busway (2007): Preparation of assessment of effects of construction of busway lanes and motorway interchange structure adjacent to and within an area of intertidal habitat in North Shore City. The construction included temporary reclamation of an area of intertidal mudflat;

5.2 Silverdale North Residential Development (2007-2008): Preparation of assessment of effects of the construction of two road bridges across the Orewa River and tributaries and the discharge of construction and operational phase stormwater to tidal areas within the Orewa River and estuary. The construction involved permanent subtidal habitat loss;

5.3 Long Bay Structure Plan Change (2007-2008): Assessment of the potential adverse effects of land use change (from rural to urban) within the Awaruku and Vaughans Stream catchments at Long Bay on the marine ecological values within the receiving environment (Long Bay-Okura Marine Reserve). The project involved presentation of expert evidence at Environment Court;

5.4 Additional Waitemata Harbour Crossing (2008-2009): Assessment of the effects of construction and operation of a proposed additional crossing of the Waitemata Harbour. The construction phase effects on marine habitat included dredging, disposal of dredge spoil, permanent loss of subtidal and intertidal habitat, reclamation works and disturbance of benthic sediment;

5.5 Waterview Connection (2009-2011): Assessment of the effects of construction and operation of the proposed connection of SH16 and SH20 and widening of the existing SH16 causeway between the Waterview and Te Atatu Interchanges. The construction phase effects on marine habitat included permanent loss of subtidal and intertidal habitat, reclamation works and disturbance of benthic sediment. The project has been approved by a Board of Inquiry;

5.6 Horokiwi Quarry Stormwater Discharges (2009-ongoing): Preparation of an assessment of the effects of stormwater discharged from the quarry via the Horokiwi Stream to the Wellington Harbour. Intertidal and subtidal surveys were carried out to characterise the existing benthic community and assess sediment deposition. Currently, BML are working with the client to improve stormwater treatment efficiency and site management practices.

5.7 Transmission Gully (2009-2012): Assessment of the effects of construction and operation of the proposed Transmission Gully alignment on marine environments along the Kāpiti Coast and Porirua Harbour. The construction phase effects on marine ecological values included potential discharge of sediment from open earthworks areas during construction, whilst operational effects included accumulation of stormwater contaminants in sediments within low energy environments. The Transmission Gully project was considered by a Board of Inquiry which confirmed the designation and granted resource consents sought for the project.

6 My evidence is given in support of the Notice of Requirement (*NoR)* and applications for resource consent lodged with the Environmental Protection Authority (*EPA)* by the NZ Transport Agency for the construction maintenance and operation of the MacKays to Peka Peka Expressway Proposal (*the Project)*.

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

8 I am the author of the Ecological Technical Report 5: Marine Habitat and Species – Descriptions and Values, which formed part of the

Assessment of Environmental Effects (*AEE)* lodged in support of the Project.[1]

9 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. My qualifications as an expert are set out above. 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

10 My evidence will deal with the following:

10.1 Executive summary;

10.2 Background and role;

10.3 Description of marine environment;

10.4 Assessment methodology;

10.5 Potential effects on marine environment;

10.6 Response to submissions;

10.7 Response to section 149G key issues reports;

10.8 Proposed conditions; and

10.9 Conclusions.

EXECUTIVE SUMMARY

11 Potential adverse effects of the Project on marine ecological values are indirect and relate to discharge of construction and operational phase stormwater to streams that discharge to the marine environment via estuaries along the Kāpiti Coast.

12 Of the five stream mouths and estuaries that are located along the coast adjacent to the Project, two small streams (Hadfield's Drain/Kowhai Stream at the northern end of the alignment, and Whareroa Stream at the south) have not been assessed as the scale of the proposed activity within their catchments is very small, and both streams discharge directly to high energy exposed beaches without intervening estuaries. The risk of adverse effects on marine ecological values is therefore negligible.

[1] Technical Report 31.

13 Only the Waikanae River, Ngarara (Waimeha) Stream[2] and Wharemauku Stream could receive discharges of construction and operational stormwater from the Project that could potentially have adverse effects on their estuaries.

14 These three estuaries have high ecological values, with the Waikanae Estuary having the greatest habitat diversity. The three estuaries have intertidal flats that are utilised as foraging areas by coastal birds.

15 Sediment contained in erosion and sediment control discharges during construction are estimated to increase above baseline over a two-month period by 9.5% (4.5 tonnes) in the Wharemauku Estuary, by 0.4% (3.97 tonnes) in the Waikanae Estuary and by 14% in the Ngarara Estuary (7.6 tonnes). The effects on marine ecological values from the increase in sediment discharges are considered to be negligible due to the high energy nature of the ultimate receiving environment which provides significant dilution and dispersal.

16 The contaminant load modelling concluded that in 2031, with the new expressway alignment fully operational, there is likely to be an overall improvement in the load of copper, zinc and total petroleum hydrocarbons discharged to aquatic environments over the existing situation (except for the Wharemauku and Waimeha Stream catchments).

17 The modelling indicates an increase in contaminant loads in the Wharemauku and Waimeha Stream catchments in 2031 during operation of the alignment. Both of these streams discharge through small estuaries to the high energy open beaches of the Kāpiti Coast, which provides significant dispersion and dilution freshwater inputs. Effects on marine ecological values of increased contaminant loads in these two catchments are considered to be negligible.

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

BACKGROUND AND ROLE

19 My role in the Project has been to assess the ecological value of the existing marine species and habitats within the Project area (Technical Report 31), to assess the potential effects of the construction and operation of the Project on those values (Technical

[2] Note that different information sources use different naming conventions for the streams in the Ngarara Catchment. The stream forks a short distance from the beach, the larger northern branch becoming Ngarara Stream, the shorter southern branch becoming Waimeha Stream.

Report 26)[3] and provide marine ecological input to the draft Ecological Management Plan (*EMP*)[4] and proposed consent conditions.

20 My evidence relies on the stormwater quality and erosion and sediment control modelling and assessment with respect to the discharge of construction phase and operational phase runoff to marine environments (refer to Technical Report 25 and Appendix H of the Construction Environmental Management Plan (*CEMP)* and the evidence of **Mr Ridley**). My evidence closely links with the evidence of **Dr Bull** and **Dr Keesing**[5]. The scope of my evidence incorporates consideration of estuarine bird feeding habitat, whereas estuarine bird populations and communities are considered in the evidence of **Dr Bull**.

THE PROJECT

21 The Project lies between 1.1 and 2.9 km inland from the coast. No physical works will occur in the coastal marine area and no consents are required under the Regional Coastal Plan.

22 Potential adverse effects relate to the discharge of construction and operational phase stormwater to streams which discharge to the marine environment.

23 Potential adverse effects of the Project on marine ecological values relate to the potential indirect effects of the discharge of sediment derived from earthworks to the marine environment via streams during construction. A range of measures are proposed for the treatment of erosion, and the capture and treatment of sediment during construction (refer to Appendix H of the CEMP and the evidence of **Mr Ridley**). Mr Ridley has assumed a 95% treatment efficiency for erosion and sediment control during construction (i.e. erosion and sediment control measures and device performance will remove an average of 95% of total suspended sediment and associated contaminants).

24 The modelling included in the Contaminant Load Assessment (Technical Report 25) indicates that there will only be increases in contaminant concentration to the Wharemauku and Waimeha Streams in operational phase discharges in 2031[6]. Both these streams discharge to high energy open sandy beaches, where significant dilution and dispersion will occur. I consider that the effects of the increase in contaminant load in these catchments will have negligible adverse effects on marine ecological values.

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3 Ecological Impact Assessment.

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

5 See Technical Report 29 which relates to avifauna, and Technical Report 30 which relates to freshwater habitats and species.

6 The other waterways modelled showed decreases in contaminant concentrations.

DESCRIPTION OF MARINE ENVIRONMENT[7]

25 Three estuaries along the Kāpiti Coast have been identified as potentially being affected by construction and operational phase stormwater discharges to streams/rivers from the Project: Ngarara Estuary (Waimeha Stream), Waikanae Estuary (Waikanae River), and Wharemauku Estuary (Wharemauku Stream).

26 Ngarara Estuary is a narrow, shallow tidal river mouth estuary with low habitat diversity. The stream mouth is modified with channelisation, construction of an esplanade strip and re-direction of the discharge across the beach. Water quality in the stream and estuary is considered to be moderate[8]. The sandflats provide a feeding area for coastal and shore birds.

27 Waikanae Estuary is a large tidal river mouth estuary that contains a variety of habitats including tidal mudflats, vegetated sandflats, sand dunes, tidal lagoons and saltmarsh and high ecological values[9]. The estuary is a Scenic Reserve (established in 1978) and forms part of the Kāpiti Marine Reserve (established in 1992). Water quality in the estuary is reduced due to the discharge of treated wastewater via the Mazengarb Drain[10]. Intertidal estuarine sandflats are important habitat for native fish, as well as a feeding resource for a variety of avifauna.

28 Wharemauku Estuary is a well flushed, small tidal mouth estuary, with modified and urbanised margins and low habitat diversity.

29 A more detailed description of each of these estuarine environments is provided as **Annexure A** to this statement of evidence. Aerial photographs are provided as **Annexure C**, showing the location of stream mouths and estuaries.

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7 Further description of the habitat context is provided in Technical Report 31 at pages 2-7, and a summary is attached to my evidence as **Annexure A**.

8 Robertson, B. & Stephens, L., 2007. Kāpiti, Southwest, South Coasts and Wellington Harbour: Risk Assessment and Monitoring Recommendations. Report prepared for Greater Wellington Regional Council by Wriggle Ltd.

9 McConkey, K.R., Bell, B.D., 2005. Activity and habitat use of waders are influenced by tide, time and weather. Emu 105: 331-340. Robertson, B. & Stephens, L., 2007. Kāpiti, Southwest, South Coasts and Wellington Harbour: Risk Assessment and Monitoring Recommendations. Report prepared for Greater Wellington Regional Council by Wriggle Ltd.

10 Robertson, B. & Stephens, L., 2007. Kāpiti, Southwest, South Coasts and Wellington Harbour: Risk Assessment and Monitoring Recommendations. Report prepared for Greater Wellington Regional Council by Wriggle Ltd.

ASSESSMENT METHODOLOGY AND ASSESSMENT OF ECOLOGICAL VALUES[11]

30 Intertidal estuarine field investigations were based on the Estuarine Environmental Assessment and Monitoring National Protocol[12]. Four sites were surveyed, namely: Ngarara Estuary, Wharemauku Estuary, and two sites within the Waikanae Estuary. Epifaunal and infaunal invertebrate community assemblages, sediment quality, and sediment grain size data were collected in May/June 2011.

31 The data collected, habitat observations and information from existing literature were compiled and formed the basis of my assessment of marine ecological values at each of the four sites surveyed. The information compiled clearly separated the four sites into two groups:

31.1 Small estuarine sites discharging to open sandy beaches (Ngarara and Wharemauku Estuaries), and

31.2 Large more sheltered estuarine sites (Waikanae Estuary).

32 The ecological features of these two groups of sites are presented in the following two tables.

Table 1: Ecological features of the Ngarara and Wharemauku Estuaries

Sediment Grain Size	Dominated by fine sand grain size.
Sediment Quality	Contaminant concentrations (copper, lead, zinc and polycyclic aromatic hydrocarbons) in surface sediment significantly below sediment quality guideline values.
Redox Discontinuity Layer	No anoxic sediment discernible within a sediment depth of c. 10 cm.
Surface Macroalgae	No macroalgae present.
Epifaunal Invertebrates	No epifauna present.
Infaunal Invertebrates	Low diversity and abundance of invertebrates, which is typical and expected in the mobile sands of an exposed beach and does not reflect a degraded habitat in this case. Shannon Wiener Diversity below 0.4.

[11] Further detail on the assessment methodology, results and ecological values is contained in Technical Report 31 at pages 7-13.

[12] Cawthron Institute, 2002.

Sensitive Invertebrates	No known sensitive invertebrate species detected.
Habitat Modification	Moderate degree of modification of the marine habitat, including channelisation, management of stream/river mouths, and periodic realignment of the Waimeha Stream drainage channel through the sandflats directly out to sea.

Table 2: Ecological features of the Waikanae Estuary

Sediment Grain Size	Dominated by fine sand grain size.
Sediment Quality	Contaminant concentrations (copper, lead, zinc and polycyclic aromatic hydrocarbons) in surface sediment significantly below sediment quality guideline values.
Redox Discontinuity Layer	Depth of anoxic sediment on average 2-4 cm below oxygenated sediment.
Surface Macroalgae	No macroalgae present.
Epifaunal Invertebrates	No epifauna present.
Infaunal Invertebrates	Invertebrate assemblage dominated by a high abundance of amphipods and gastropods. Shannon Wiener Diversity just below 1.
Sensitive Invertebrates	Sensitive invertebrate species detected e.g. pipi (*Paphies australis*).
Habitat Modification	Largely unmodified habitat.

33 All three estuaries were assessed as having high ecological values due to low sediment contaminant concentrations, sediment grain size distribution dominated by sand, anoxic sediment either relatively deep or not detected, the diversity and abundance of invertebrates reflecting not impacted habitats and habitat modification within the estuaries not extensive. In the case of the Waikanae Estuary, there was also high habitat diversity and sensitive invertebrate species present.

POTENTIAL EFFECTS ON THE MARINE ENVIRONMENT

34 Adverse effects on marine ecological values may arise from the discharge of treated construction generated sediment and/or from the discharge of treated road runoff (sediment and associated contaminants) in the operational phase.

35 Potential effects of construction generated sediment are a factor of duration of exposure combined with the concentration of suspended sediment or depth of deposited sediment. Operational phase treated road runoff has an additional factor to consider, which is the concentration of contaminants attached to discharged sediment.

36 For both construction and operational phase discharges, there are greater risks of adverse effects where discharges occur into sheltered quiescent marine habitats, such as harbours and estuaries, as opposed to exposed high energy habitats.

Construction Phase Effects

37 Potential effects of sediment discharge on the Wharemauku Stream mouth, Waikanae Estuary, and Ngarara Estuary are considered in turn in the following paragraphs of my evidence, based on the sediment yield calculations of **Mr Graeme Ridley**[13]. My understanding of the sediment generation calculations undertaken by Mr Ridley are that they are comparative analysis tools, not definitive sediment volume calculations. These calculations have guided my assessment of effects of construction on marine ecological values.

38 Mr Ridley's sediment generation calculations take into account existing sediment generation discharged to each waterway from other land use activities within their catchments (e.g. erosion, earthworks from subdivision, and harvesting of pine) and this forms the baseline. The sediment contributions from the construction of this Project are presented as a percentage increase above the baseline.

39 An average treatment efficiency of 95% has been incorporated into Mr Ridley's calculations - i.e. 95% of sediment and associated contaminants generated from the construction earthworks will be captured, with only 5% allowed to discharge to aquatic environments.

40 Mr Ridley's sediment yield calculations are based on a 2-month earthworks period as this is assumed to be the expected period that each earthworks area will be open (i.e. unstabilised) based on the progressive nature of the construction sequence and the need to manage dust through provision of a stabilised surface[14].

41 Sediment discharged to the **Wharemauku Stream** over a two-month period during construction is estimated to increase by 9.5% above baseline (4.5 tonnes).[15] The crossing of the Wharemauku Stream and associated erosion and sediment control discharge point lies 1.78 km upstream of the mouth of the stream[16]. The Stream

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13 Sediment Yield Table, page 14, Construction Environmental Management Plan (*CEMP*) Appendix H – Erosion and Sediment Control Plan.

14 CEMP Appendix H, Erosion and Sediment Control Plan, page 15, Evidence in Chief of Mr Ridley (para 51).

15 Page 15, CEMP Appendix H – Erosion and Sediment Control Plan.

16 Erosion and Sediment Control Plan CV-CM-206 (approximately chainage 5400).

discharges to the high energy open coast at Raumati Beach, where significant flushing and dilution occurs. Because of this flushing and dilution, it is anticipated that the predicted increase in sediment discharge to the Stream during rainfall events occurring when earthworks is open in this catchment will have negligible effects on the marine ecological values at this site.

42 I understand the predicted increase in sediment discharge to the **Waikanae River and Estuary** over a two month period during open earthworks in the catchment is 0.4% or 3.97 tonnes[17]. The crossing of the Waikanae River and associated erosion and sediment control discharge point lies approximately 1.3 km up river of the tidal estuary[18]. The baseline sediment discharge in this catchment over this period is relatively high at approximately 650 tonnes. Even though the Waikanae Estuary is a more sheltered low energy environment compared to the high energy open sandy beaches adjacent to the other sites considered, the adverse effects on estuarine/marine ecological values resulting from the predicted increase of sediment are considered to be negligible. Similarly, I consider the effects on the distribution and abundance of invertebrates that form the diet of some wading birds[19] to be negligible.

43 The **Ngarara Estuary** receives runoff from the Waimeha and Ngarara catchments via the Waimeha Stream. The nearest construction works within this catchment are the interchange and crossing of the Waimeha Stream and associated erosion and sediment control discharge point which lie 1.4 km upstream of the mouth of the stream[20]. The works in the Ngarara arm of this catchment lie 3.6 km upstream of the stream mouth.

44 Ngarara Stream discharges to the high energy open coast via a relatively narrow and shallow stream mouth. Sediment discharged to the Waimeha Stream is predicted to increase by 0.77 tonnes, which is a 25% increase. Sediment discharged to the Ngarara Stream is predicted to increase by 6.83 tonnes which is a 9.8% increase[21]. Overall, the predicted increase in sediment discharged to the Ngarara Estuary is 7.6 tonnes, or 14%. The discharge point is approximately 1.5 km upstream of the stream mouth, and sediment is expected to be carried to the open coast during rainfall events. It is important to note that not all the predicted sediment will discharge at one time during construction, but rather over several rainfall events. At the open coast sediment will be rapidly diluted and dispersed with negligible effects on marine ecological values.

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17 Page 15, CEMP Appendix H – Erosion and Sediment Control Plan.

18 Erosion and Sediment Control Plan CV-CM-215 (approximately chainage 10600).

19 Evidence in Chief of **Dr Bull**.

20 Erosion and Sediment Control Plan CV-CM-217 (approximately chainage 11900).

21 Page 15, CEMP Appendix H – Erosion and Sediment Control Plan.

Operational Phase Effects

45 A Contaminant Load Assessment was carried out (Technical Report 25) to model potential contaminant discharge from the road surface to streams during operation of the proposed alignment. The modelling considered a point 20 years into the future (2031).

46 The modelling indicated that even without stormwater treatment, when fully operational the proposed alignment is likely to lead to an overall improvement in the load of copper, zinc and total petroleum hydrocarbons discharged to aquatic environments over the existing situation (except for Wharemauku and Waimeha Stream catchments). Therefore there will be a net positive change for the Waikanae River and Estuary.

47 The increase in contaminant discharge in the Wharemauku catchment is most likely due to an increase in traffic counts on Kāpiti Road in the future 2031 land use scenario[22]. The increase in the Waimeha Stream catchment is most likely due to the redistribution of the traffic from the local roading network (which does not pass through the Waimeha catchment) onto the new road alignment[23]. Both of these streams discharge through small estuaries to the high energy open beaches of the Kāpiti Coast, which provides significant dispersion and dilution freshwater inputs.

48 Accordingly, I consider that the effects of increased contaminant loads in these two catchments would have negligible effects on marine ecological values. The net reduction in contaminants discharging to the more sensitive and valuable Waikanae Estuary can be viewed as an ecological benefit.

RESPONSE TO SUBMISSIONS

49 In this section of my evidence I will address submissions that raise issues relevant to my area of expertise.

Damage to marine life and estuaries

50 Concerns were raised by several submitters[24] regarding potential damage to the marine flora and fauna that inhabit the estuaries and beaches along the Kāpiti Coast. My assessment and evidence considered the potential adverse effects of construction and operation of the Project on marine and estuarine ecological values. As discussed earlier, the potential effects on marine ecological values identified were indirect effects relating to the discharge of sediment during the construction phase, and sediment and associated contaminants during the operational phase. However, all potential adverse effects were assessed as negligible.

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22 Technical Report 25, Section 4.3, page 29. Evidence in Chief of **Mr Levy**.

23 Ibid.

24 Including submitters: Anderton & Abigail #0293, Keno #0357, Cumming #0380, Staniland #0577, Brittain # 0676.

Damage to dunes

51 Potential damage to dunes was raised by a submitter.[25] There are no direct effects of the Project on the marine environment, including sand dunes. The indirect (and negligible) effects from the discharge of sediment and contaminants during the construction and operational phases will similarly have negligible adverse effects on sand dunes.

Damage to Waikanae Estuary Scientific Reserve and Kāpiti Marine Reserve

52 Potential damage to the nationally significant Waikanae Estuary Scientific Reserve and Kāpiti Marine Reserve was raised by a number of submitters.[26] Potential adverse effects from the construction and operation of the Project on the estuarine/marine ecological values within the Waikanae Estuary and Kāpiti Marine Reserve have been assessed as negligible. Based on the sediment and stormwater contaminant modelling information provided to me, I remain confident that my assessment is robust and correct.

Submission from Kāpiti Coast District Council (*KCDC*) #0682

53 KCDC raised concerns regarding downstream impacts of sediment and stormwater discharge on the Waikanae Estuary, the linking of monitoring to adaptive management proposed in order to avoid, remedy or mitigate adverse effects on estuaries, and the provision of appropriate conditions to ensure that adaptive management follows international best practice.[27]

54 Based on the assessment of effects on marine ecological values, I conclude that the downstream impacts of sediment and stormwater contaminants discharged to the Waikanae Estuary will be negligible. The predicted increase in sediment discharged to the Waikanae Estuary is 0.4%[28] and contaminant loads are predicted to decrease.[29]

55 Monitoring (periodic and triggered) of the benthic invertebrate assemblage and sediment quality at two sites within the Waikanae Estuary is proposed and provided for in the CEMP[30]. and in the Baseline Ecological Management Plan[31] Trigger events for further marine monitoring and recommended criteria for the establishment of significant effects are also detailed in the CEMP.[32] The proposed conditions of consent state the timeframes for monitoring and the

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25 Submitter: Anderton & Abigail #0293.

26 Including submitters: Keno #0357, Frost #0496, Brittain 0676, Bull #0016.

27 KCDC submission, paras 34, 50 and 52.

28 Refer paragraph 42 above.

29 Refer paragraph 46 above.

30 CEMP Appendix M, Ecological Management Plan, Section 4.5.1-4.5.3, pages 62-64.

31 Annexure D, Evidence in Chief of **Dr Keesing**.

32 CEMP Appendix M, Ecological Management Plan, Section 4.5.1-4.5.3, pages 63-64

adaptive management steps to be taken should a trigger event occur or should routine monitoring reveal significant differences in ecological values[33].

56 I consider that the provisions in the EMP and the conditions proposed provide robust protection to marine ecological values. I do not consider further information or detail is necessary, especially given that the magnitude of the potential effects identified is negligible in all instances relating to marine ecology.

57 With respect to issues raised regarding coastal land forms and natural character, I note that these are addressed in evidence in chief of **Mr Fuller**.

Submission from Department of Conservation (*DoC*) #0468

58 DoC raised concerns regarding the Waikanae River Mouth and the period of preconstruction monitoring. DoC further stated that protection of indigenous vegetation associated sand dunes and wetlands is a national priority.

59 My assessment concludes that the potential adverse effects on the Waikanae Estuary (and river mouth) are negligible, given the low increase in sediment predicted during construction and the decrease in the concentration of contaminants discharged to the Waikanae River. I stand by my assessment of effects.

Submission from Greater Wellington Regional Council (GWRC) #0684

60 GWRC's submission requested clarification around some components of the Project to enable accurate assessment of the impacts on marine environments and biodiversity. It stated that GWRC needed further information in order to determine the adequacy of the measures proposed to avoid, remedy and mitigate those effects. The GWRC also requested further information to enable an assessment of the adequacy of criteria and methods used to assess the significance of ecological values of some areas affected by the works.[34]

61 On 22 August 2012, the GWRC produced a without prejudice Discussion Document to provide further detail on the matters raised in its submission. The Document questions the sediment yield calculations carried out and states that further modelling may be appropriate and may affect the assessment of effects on the marine environment and mitigation measured proposed. They also raise

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[33] See proposed conditions G.38-G.40 contained in **Annexure B** of this evidence for ease of reference.

[34] GWRC submission, page 4. It was understood that detail of the further information sought by GWRC was set out in GWRC's Key Issues Report (which is addressed separately in my evidence).

concerns regarding the assessment of the discharge of cement contaminated stormwater.[35]

62 **Mr Ridley** responds to the above issues in his evidence in chief as follows; sediment yield calculation issue, and suggestion of additional modelling of different size rainfall events.[36] I agree with Mr Ridley's rationale for not modelling a range of rainfall event sizes based on the understanding that a comparative analysis against baseline sediment generation would reveal similar proportionate difference in sediment yield regardless of rainfall event size.

63 The ultimate receiving environment for sediment discharged to streams during construction of the Project is the Tasman Sea via a number of high energy exposed beaches. These exposed beach habitats provide significant dilution and dispersion of discharged sediment. The waterway with the largest intertidal estuary habitat is the estuary at the mouth of the Waikanae River. The intertidal habitat towards the mouth of the river is dynamic with changes to channel morphology, scouring of sediment during storm events and deposition of sediment a common occurrence. The small additional volume of sediment that may be added to this system during construction of the Project, in my opinion, will have negligible adverse effect on marine ecological values. Therefore, given this low risk, I do not consider that further modelling is required or justified in this case.

RESPONSE TO SECTION 149G REPORTS

64 I have read the Key Issues Reports prepared by the KCDC (dated 8 June 2012) and by GWRC (dated 11 June 2012) pursuant to section 149G(3) of the RMA. In this section of my evidence I will respond to key issues related to marine ecology if not already addressed in my evidence.

GWRC Report

65 I note that the GWRC Report confirms that the Project is not located within the coastal marine area (*CMA*), nor that there are any direct discharges to the CMA. It goes on to state that:

> However, the marine environment is the ultimate receiving environment for the treated stormwater runoff and cement contained water from construction of the project and stormwater runoff from road surfaces from the operation of the Project.[37]

66 I have addressed the matters around stormwater runoff and sediment in paragraphs 34-48 of my evidence above. Cement contained water is considered by **Mr Ridley** in his evidence in chief.

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35 Discussion Document, paras 1.1 – 1.2.

36 Refer paragraphs 117 and 119, **Mr Ridley**, Evidence in Chief

37 GWRC Key Issues Report, paras 27 and 99.

67 In marine water, dilute discharges of cement (within discharge quality standards) are unlikely to result in a significant change in pH due to the buffering capacity of seawater and are therefore unlikely to result in adverse effects on marine ecological values. I do not consider the use of cement around waterways a significant risk to marine ecological values so long as best practice site management and erosion and sediment control techniques and processes are in place, in addition to discharge quality monitoring.[38]

68 I note that the GWRC Report mentions (at paragraphs 29-30) that the New Zealand Coastal Policy Statement (NZCPS) Policy 11 (Indigenous Biological Diversity) is not addressed. In my opinion, based on my assessment of marine ecological values and potential ecological effects arising from construction and operation of the Project, the adverse effects on indigenous marine biological diversity are likely to be negligible.

69 The GWRC Report also confirms that the Project does not require any resource consents pursuant to the Regional Coastal Plan.[39]

KCDC Report

70 The KCDC Key Issues Report does not address marine ecological effects other than a brief consideration of the NZCPS. It concludes that the issues around the Coastal Marine Area are predominantly within the jurisdiction of the Regional Council.[40]

PROPOSED CONDITIONS AND MONITORING PLANS

71 Since lodgement, I have been involved in the preparation of a baseline monitoring plan for freshwater and marine fauna and habitats[41] and I have commenced surveys. The purpose of these surveys to help determine triggers for adaptive management, and to provide sufficient pre-construction data on species and habitats to allow comparisons during construction. The baseline freshwater and marine ecology plan has been presented to GWRC for its consideration. Completion of the EMP (as described in proposed conditions G.34 to G.37)[42], ongoing construction monitoring (proposed conditions G.38 to G.39) and potential adaptive management (proposed conditions G.40) will **rely** on the results of these baseline studies.

72 Proposed resource consent conditions G.38-G.40[43] provide for the routine monitoring of marine ecological values prior to construction,

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38 Evidence in chief of **Mr Ridley.**

39 GWRC Key Issues Report, para 99.

40 KCDC Key Issue Report, para 4.4.2.

41 See Annexure D attached to **Dr Keesing's** evidence in chief.

42 Sections 4.5 to 4.5.3 of the draft EMP.

43 A copy of these conditions is contained in **Annexure B** to my evidence.

during construction and post construction as outlined in the draft EMP.[44] These conditions also allow for triggered monitoring as an adaptive management response,[45] for example in response to erosion and sediment control device failure, contaminant spills, or anomalous ecological monitoring results. Details of both routine and triggered monitoring are provided in the EMP.[46]

73 In my opinion, these conditions and measures provide appropriate protection to the marine ecological values, given the low potential risk of adverse effects.

CONCLUSIONS

74 The indirect effects of construction and operational phase stormwater on marine ecological values along the Kāpiti Coast are considered to be negligible, due to the relatively low level changes in sediment and contaminants likely to be discharged and the nature of the ultimate receiving environment (i.e. high energy open sandy beaches).

_____
Dr Sharon De Luca
31 August 2012

[44] AEE, Volume 4, Appendix M to the CEMP.

[45] Adaptive management, in an ecological sense, is a structured, iterative process of robust decision making that can be used when ecological effects of an activity are not completely known, with an aim to reduce uncertainty over time via feedback mechanisms arising from ecological monitoring data.

[46] Section 4.5, Ecological Management Plan, pages 61-64.

ANNEXURE A: SUMMARY OF ESTUARINE ENVIRONMENTS

1 Ngarara Estuary

2 Waikanae Estuary

3 Wharemauku Estuary

1. Ngarara Estuary

Characteristics

- Receives discharges from the Waimeha and Ngarara Streams.
- Narrow (5-10m), shallow (0.5m) tidal river mouth estuary.
- Catchment mainly pastureland, with some urban landuse.
- Water quality in streams affected by agricultural runoff.
- Location of stream drainage channel across the sandflats regularly maintained by excavator.

Values

- Estuarine habitat diversity low.
- Lack of saltmarsh vegetation and prevalence of weed species.
- Moderate upstream habitat modification.
- Dominated by fine sand grain size.
- Contaminants in surface sediment low.
- No anoxic sediment, macroalgae or epifauna detected.
- Low diversity and abundance of infaunal invertebrates.
- Intertidal flats are a foraging area for coastal and shore birds (e.g. red-billed gulls, Caspian terns, pied stilts).

General Description

The ecological value of the marine/estuarine receiving environment is assessed as high.

The streams discharge to the ultimate marine receiving environment via a high energy open sandy beach to the Tasman Sea.

Due to the relatively close proximity to the Waikanae Estuary, other coastal and shore birds may occasionally be present.

The Ngarara Estuary is a popular site for recreational activities, which increases both the demand for development and consequent threats to the ecosystem.

Scale of works

- Indirect effects only – receiving treated runoff during construction and operation of alignment.

Works Monitoring

- Monitoring is not justified, given the high energy, dynamic receiving environment.

Mitigation Monitoring

- No mitigation works proposed.

2. Waikanae Estuary

Characteristics

- Water quality in the estuary is reduced due to the discharge of treated wastewater via the Mazengarb Drain.
- Estuary approximately 1.5km long, 40-50m wide, with an average water depth of 1-3m.
- The Waikanae Estuary Scientific Reserve was established in 1978.
- The intertidal area within the estuary is within the Kapiti Marine Reserve (established in 1992).
- There are ongoing revegetation programmes within the scientific reserve.
- Estuary largely unmodified.

Values

- The estuary contains a variety of habitat types, including mudflats, sandflats, vegetated sandflats, sand dunes, tidal lagoons and saltmarsh.
- Intertidal sand flats provide important habitat for native fish and coastal/shore birds.
- Dominated by fine sand grain size.
- Contaminants in surface sediment low.
- Depth of oxygenated sediment on top of anoxic sediment 2-4cm.
- No macroalgae or epifauna detected.
- Invertebrate assemblage dominated by amphipods and gastropods, with sensitive species present.

General Description

The ecological value of the marine/estuarine receiving environment is assessed as high.

The stream discharges to the ultimate marine receiving environment via a high energy open sandy beach to the Tasman Sea.

The estuary is an important habitat for migratory and resident birds.

Scale of works

- Construction of bridge piers and channel widening for flood control in the stream above the estuary.
- Indirect effects on the estuary only – receiving treated runoff during construction and operation of alignment.

Works Monitoring

- Monitor potential sedimentation effects at two sites within the estuary during construction.

Mitigation Monitoring

- No mitigation works proposed.

3. Wharemauku Estuary

Characteristics

- Shallow, small tidal river mouth estuary, approximately 3-5m wide.
- Margins of the estuary moderately modified with sea walls and houses on the foredunes.
- The stream discharges to the sandflats along the open coast of Raumati Beach.

Values

- Estuarine habitat diversity low.
- Dominated by fine sand grain size.
- Contaminants in surface sediment low.
- No anoxic sediment, macroalgae or epifauna present.
- Low diversity and abundance of infaunal invertebrates.

General Description

The ecological values of the marine/estuarine receiving environment are assessed as high.

The Wharemauku Stream is a highly modified urban drain, channelised and influenced by urban (Paraparaumu Town) and industrial activities, as well as discharge from adjoining drains from peat lands and residential areas.

The stream discharges to an open sandy beach into the Tasman Sea.

Water quality in the stream is often poor. However, given the flushing afforded to the estuary it is unlikely that stream water quality has adverse effects on estuarine organisms.

Scale of works

- No earthworks in close proximity due to bridging and allowance for future roading underpass and walkway and flooding.

Works monitoring

- Ecologically we do not believe monitoring is justified.

Mitigation monitoring

No mitigation works proposed

ANNEXURE B: PROPOSED CONSENT CONDITIONS – MARINE ECOLOGY RELATED[47]

G.38	Monitoring shall be carried out in accordance with the EMP as required by Condition G.34 in order to: (a) collect baseline information on vegetation, wetlands, freshwater and marine ecology for 1 year prior to construction work starting; (b) collect ecological information on vegetation, wetlands, freshwater and marine ecology during construction work; (c) collect ecological information on vegetation, wetlands, freshwater and marine ecology for 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 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 undertaken: A. Identify the on-site practice that is generating the effect;

[47] As lodged with the AEE/application.

	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.

ANNEXURE C: AERIAL IMAGES OF STREAM MOUTHS AND ESTUARIES

Location of Stream Mouths and Estuaries

Figure 1

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www.boffamiskell.co.nz

Date: 21 August 2012 | Revision: 0
Plan prepared by Boffa Miskell Limited
Author: lucy.manning@boffamiskell.co.nz | *Checked:* SDL

Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Hadfield Drain/Kowhai Stream mouth

Hadfield Drain/Kowhai Stream mouth

Boffa Miskell

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Hadfield Drain/Kowhai Stream and Stream Mouth

Figure 1a

Date: 21 August 2012 | Revision: 0

Plan prepared by Boffa Miskell Limited

Author: lucy.manning@boffamiskell.co.nz | *Checked:* SDL

Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Waimeha Stream Mouth

Waimeha Stream and Stream Mouth

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Waimeha Stream and Stream Mouth

Figure 1b

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Author: lucy.manning@boffamiskell.co.nz | *Checked:* SDL

Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Waikanae Estuary

Waikanae Estuary

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Waikanae Estuary

Figure 1c

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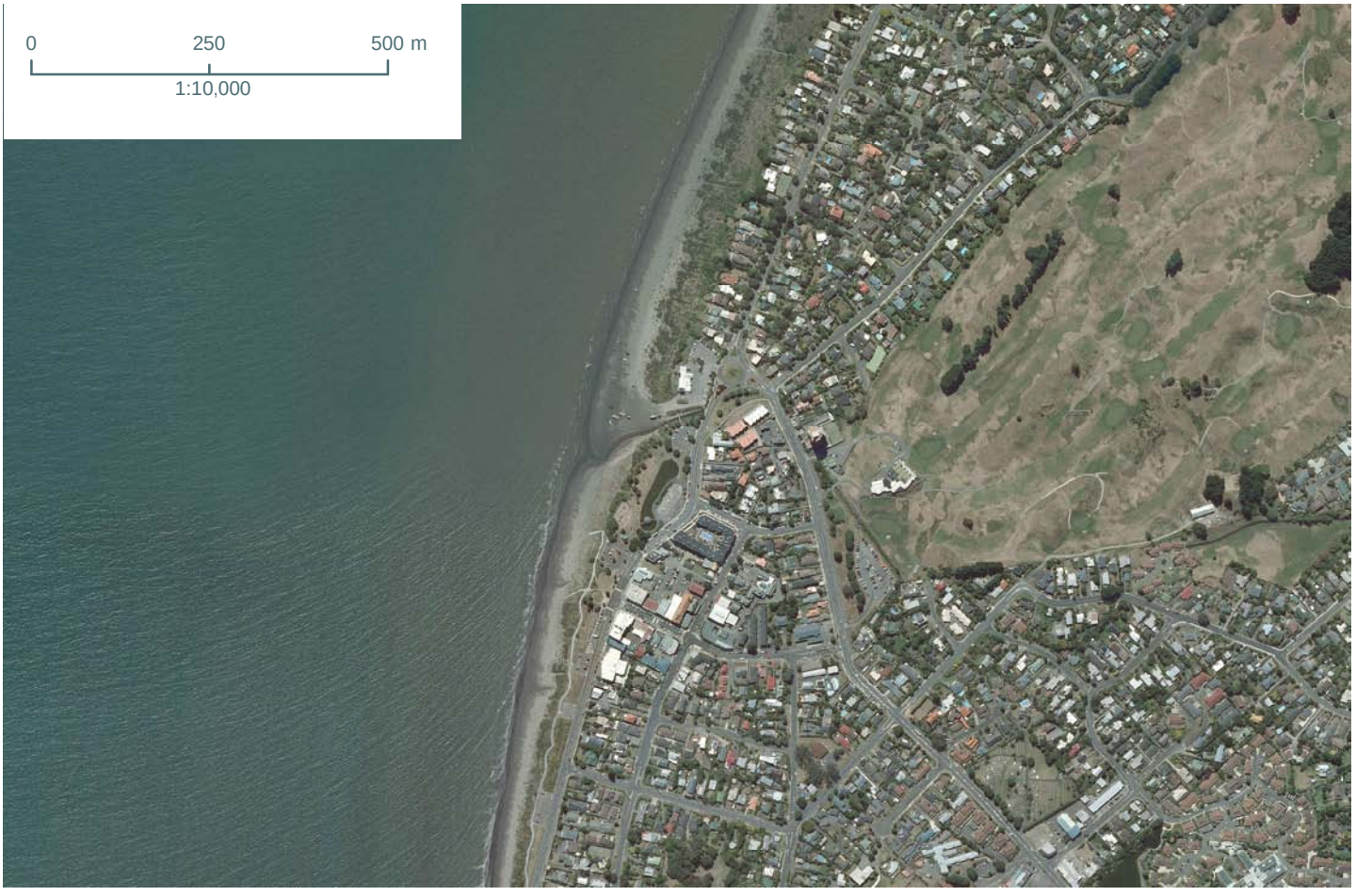
Author: lucy.manning@boffamiskell.co.nz | *Checked:* SDL

Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Tikotu Creek



Tikotu Creek and Creek Mouth

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Tikotu Creek and Creek Mouth

Figure 1d

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Author: lucy.manning@boffamiskell.co.nz | *Checked:* SDL

Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Wharemauku Stream Mouth

Wharemauku Stream and Stream Mouth

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Wharemauku Stream and Stream Mouth

Figure 1e

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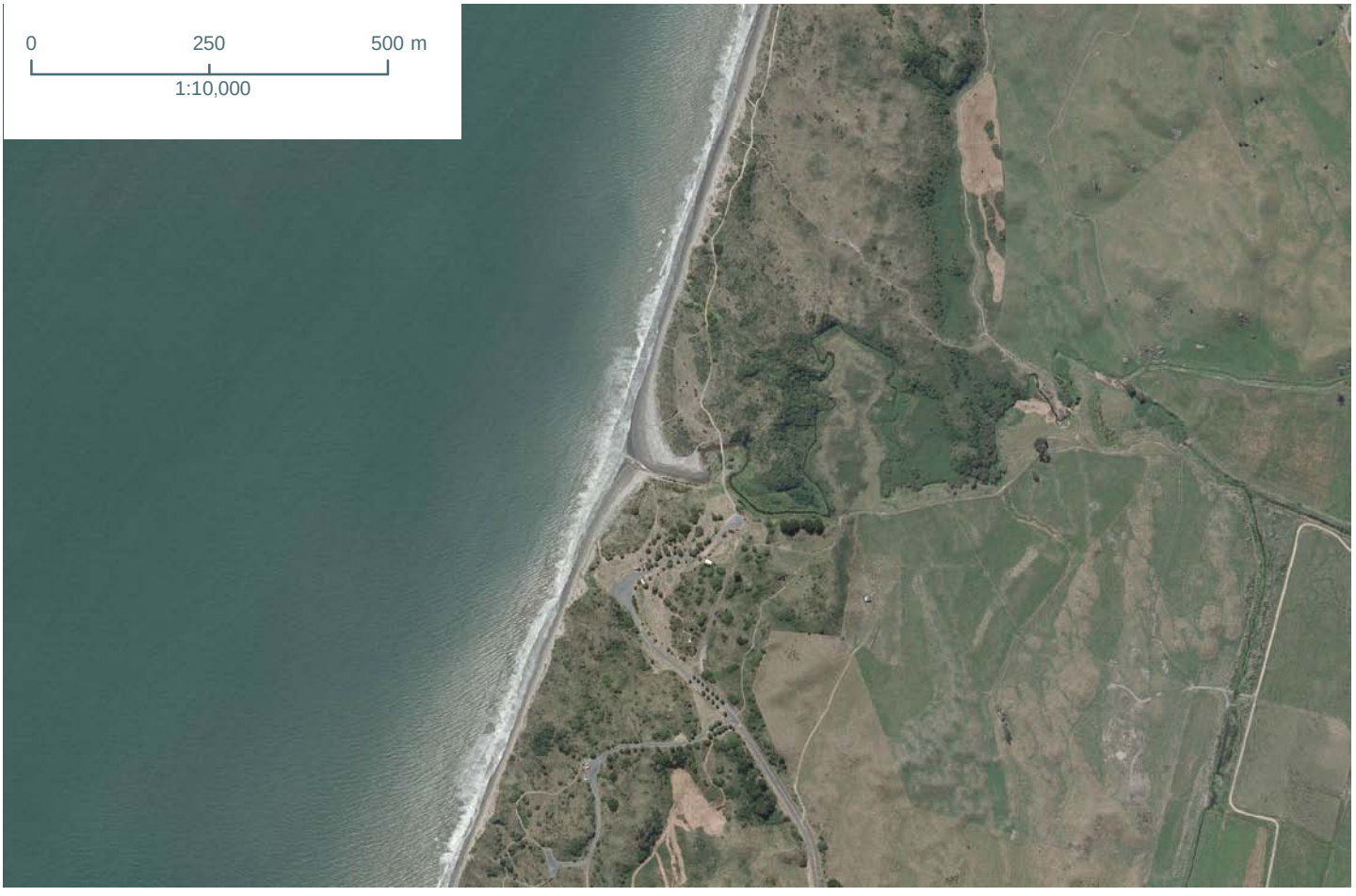
Data Sources: Aerial Photography 2010, Greater Wellington Regional Council

Projection: NZGD 2000 New Zealand Transverse Mercator

Close up of Whareroa Stream Mouth



Whareroa Stream and Stream Mouth

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Whareroa Stream and Stream Mouth

Figure 1f

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