**IN THE MATTER OF** the Resource Management Act 1991

**AND**

**IN THE MATTER OF** resource consent applications and Notices of Requirement by the Bay of Plenty Regional Council to undertake the proposed Kaituna River Re-diversion and Ongatoro / Maketū Estuary Enhancement Project

---

**STATEMENT OF EVIDENCE OF ROGER JOHN MACGIBBON**

---

## INTRODUCTION

### Qualifications and experience

1. My full name is Roger John MacGibbon. I am a Principal Ecologist at Opus International Consultants Limited, where I have been since 2010.

2. I hold a Bachelor of Science Degree with Honours in Zoology and Ecology from the University of Canterbury (1981). I am a member of the New Zealand Ecological Society and a Founding Trustee of Tane's Tree Trust.

3. I have practised in the ecological restoration, monitoring and conservation management field for over 30 years having worked for the NZ Forest Service, Department of Conservation and several private companies, including my own environmental consultancy for 15 of those years.

4. I specialise in providing technical advice and project management skills on matters related to the ecological management, monitoring and restoration of terrestrial, freshwater and coastal environments, the rehabilitation of damaged landscapes such as mines and quarries, the enhancement of water quality in natural waterways (rivers, stream, wetlands and estuaries), the control and eradication of weeds and pests, and the management and reintroduction of animals (invertebrates and vertebrates) to restored environments.

**Scope of Evidence**

5. I have been involved in the Project since 2013. I have been responsible for assessing the potential for effects of the Project on the existing terrestrial ecology and avifauna and for developing and assessing the wetland restoration components of the Project.

6. My evidence describes:

   6.1 The existing ecological values of the Ongatoro / Maketu Estuary in terms of vegetation, avifauna, and habitat;

   6.2 The potential effects of the Project on vegetation and fauna;

   6.3 The potential effects of the Project on avifauna;

   6.4 Recommended mitigation; and

   6.5 The wetland restoration proposal.

7. I will provide comments on the submissions as they relate to the scope of my evidence. Other witnesses also provide comments on the submissions relevant to their areas of expertise and project involvement.

8. I have read and am familiar with the section 42A report and the proposed set of consent conditions and will refer to these where relevant to my evidence.

9. Lastly, I have read the Code of Conduct for Expert Witnesses in the Updated Environment Court Practice Note (2014) and agree to comply with the Code. This evidence is within my area of expertise, except where relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

**EXECUTIVE SUMMARY**

10. The Kaituna River Re-diversion and Ongatoro / Maketū Estuary Enhancement Project proposes to re-divert an additional 16% (for a total of 20%) of the Kaituna River's flow back into Ongatoro / Maketū Estuary (the Estuary) to improve the health and restore some of the mauri of the area by allowing salt marsh and freshwater wetlands to recover creating more suitable habitat for a range of species, and to reduce the rate at which sand fills in the Estuary and potentially set in motion a process of gradual sand erosion.

11. In addition, a sizable area, up to 27.5 ha, of wetland will be re-established around the Estuary margins on land that was largely wetland prior to development for farming.

12. None of the physical and chemical changes likely to occur as a result of the Project are expected to have other than minor adverse effects on the remaining salt marsh areas within the Estuary.

13. It is likely that there will be some changes in species composition of the vegetation in parts of the Titchmarsh wetland in response to the predicted increase in salinity in the lower Kaituna River. However, vegetation collapse within the Titchmarsh wetland area is not considered likely as a result of the re-diversion because of the existing predominance of salt tolerant species along the margins that are likely to be exposed to the increased salinity. A monitoring programme has been recommended to track any vegetative changes and contingency mitigation measures proposed should they be necessary.

14. The vegetation on Ford Island may change slightly as a result of salinity changes, with a small improvement in species diversity and percentage cover likely on the eastern edge.

15. Maketu Spit vegetation is not expected to change significantly as a result of the Project.

16. There is a low risk of accelerated erosion along parts of the southern edge of Papahikahawai Island if the stopbanks are removed. From an ecological perspective, removal of the stopbanks and creation of a natural ecotone from estuarine sand flats through estuarine wetland, palustrine wetland and into terrestrial vegetation would maximise the benefits of the Project. However, due to the uncertainty about the risk of accelerated erosion, postponement of the removal of the stopbanks on the island is recommended until a better understanding of the impact of the Project on erosion is obtained.

17. There has been a reduction in ground level of up to 600mm on the Brain land over the last 30 years as a result of land drainage, peat mineralisation and compaction, and consequently most of the Brain land is likely now to be predominantly suitable for salt marsh species rather than the freshwater species that once grew there.

18. Changes to salinity and removal of the stopbanks in the north-western corner of the Estuary may create conditions suitable for salt marsh species to establish naturally or be replanted.

19. Predicted increases in current flow may make the estuarine conditions in the area of the historical large salt marsh to the south of Papahikahawai Island (that has since disappeared) unsuitable for the re-establishment of salt marsh.

20. No adverse effects are expected on the shorebird and wader avifauna currently using the Estuary. The potential increase in estuarine benthic invertebrate fauna may lead to increased and improved feeding grounds for waders.

21. Birds inhabiting the remaining salt marsh areas are unlikely to be adversely affected by the re-diversion because the existing salt marsh areas are expected to remain intact (and some may enlarge naturally).

22. There is some risk of a small decline in the size of the Titchmarsh wetland which may have an effect on the wetland bird species inhabiting this area but this is likely to be more than compensated for by a substantial increase in wetland habitat that will occur with the proposed restoration of up to 27.5 ha of wetland on the Brain land and Papahikahawai Island (the latter being as part of the wider and concurrent initiatives rather than the Project directly).

23. No adverse effects are expected on the existing ecology as a result of the restoration of the areas of wetland. On the contrary, substantial beneficial effects are anticipated. The diversity and abundance of indigenous plants and animals will increase substantially as a result of the increased area of high value habitat and increased biological productivity.

24. Aspects of water quality may also improve as a result of the removal of grazing livestock from the Estuary margins and the nutrient trapping and extraction capacity of healthy functioning wetlands.

## DESCRIPTION OF THE SITE AND ECOLOGY

### Current Ongatoro / Maketū Estuary vegetation cover and assessment of ecological values

25. The ecological values of the Estuary and its immediate surrounds have declined in direct proportion to the reduction of salt marsh and freshwater wetlands, and the drainage of land for farming activities.

26. The existing indigenous vegetation on the edge of, and in close proximity to the Estuary, is a tiny fragment of what occurred in this area before drainage and land development. The area of salt marsh wetland has declined by 92-95% since the 1950's to be less than 9 ha, and less than 4 ha of freshwater wetland that is hydraulically linked to the Estuary remains of the thousands of hectares that existed 150 years ago. Less than 0.004 ha (40 $m^2$) of eelgrass / sea grass remains compared to around 13 ha in 1948.

27. A number of reasons have been proposed for the significant decline in the Estuary vegetated wetland area, but there is little doubt that the construction of stopbanks in and around the Estuary margins and the diversion of the Kaituna River have contributed to this decline.

28. In some areas, such as along the southern edge of the Estuary, the stopbanks lie hard up against the main channel, leaving no room for establishment of indigenous wetland margin plants. In other areas, especially along the Estuary side of Ongatoro - Maketū Spit, the transition from open estuarine water to terrestrial conditions occurs over a very narrow distance. In addition to reducing the diversity and abundance of plant species occupying these zones, the reduction in aerial extent of these zones has greatly reduced the habitat for fauna.

29. The Titchmarsh wetland area, to the immediate west of the existing cut to the Estuary is the largest remaining freshwater (palustrine) wetland area downstream of Kaituna Wetland that is generally connected with the Estuary.

30. No threatened plant species were found along any of the transects or along the courses followed during the various walk-through site reconnaissance surveys. However, the threatened sand tussock hinarepe, *Poa billardierei,* is known to occur naturally in the eastern most 800 metres of the spit. The largest known Bay of Plenty population of this species exists on the dunes approximately 2km west of Te Tumu Cut. Mangrove seedlings are found in the south eastern corner of the estuary, but appear to be removed by people from time to time.

31. The plant communities that remain around the Estuary margins appear to have reached a reasonable state of equilibrium and there is no evidence of significant recent change or deterioration. Retention of the remaining areas of salt marsh wetland is considered to be an ecological priority.

**Current avifauna populations and assessment of ecological values**

32. The number of shorebird and water species occurring in the Estuary and Kaituna River near its mouth does not appear to have varied greatly over the past 30 years, with most of the species recorded in 1996 still present in 2012-13.

33. Wetland and marshland bird species have been counted infrequently and in very low numbers in the Estuary and near the river mouth, reflecting the lack of suitable habitat remaining.

34. The Ongatoro - Maketū estuary is a recognised site of high ecological value for shorebirds, especially annual migrants from the northern hemisphere. 22 migratory species have been recorded in or near the Estuary over the last 30 years, and another 29 native species, many of them shorebirds, have also been observed.

35. No substantive bird survey data has been found that pre-dates the 1970's, including the period prior to the diversion of the Kaituna River in 1956/7. Consequently, there is no clear picture as to whether avian diversity and abundance has increased, decreased or remained static following the diversion. The area of tidal mudflats has increased as a result of the decline of the salt marsh in the Estuary, potentially increasing the feeding habitat available for shorebirds, however, Hamill (2014)[1] has noted that the upper parts of the Estuary have low macrofauna abundance and diversity suggesting that the extent of the feeding grounds in the Estuary may not have changed greatly.

36. The bird survey data collected since 1984 provides no clear picture of any trends in species diversity and abundance over the past 30 years. Owen et al. (2006)[2] has shown that some species have shown statistically significant increases over that period while others have declined significantly. The diversity and abundance of species using the Estuary remains high enough for the area to warrant the continued status as a "hot spot" for shorebird species.

37. The diversity and abundance of marshland and wetland bird species in the Estuary is now small, reflecting the substantial loss of salt marsh and freshwater wetland habitat since the river diversion. Only 16 of the 59 species that inhabit the Kaituna Wildlife Management Reserve have been recorded in the Estuary and Kaituna River mouth areas, and many of those are in very small numbers and mostly in the area of the Titchmarsh wetland and lower river margins. While no data exists from the period prior to the Kaituna River diversion, it is very likely that all or most of the species currently inhabiting the Kaituna Wildlife Management Reserve were present within the 170 ha of salt marsh and wetlands that existed within the Estuary prior to diversion and conversion to farmland.

38. The Titchmarsh wetland and the remaining areas of salt marsh (especially the area beside Maketū Road) are important remnant areas of high ecological value for wetland bird species. For this reason, protection and enhancement of those areas as bird habitat should be a priority.

**Assessment of the ecological value of habitat for other fauna (excluding birds)**

39. River margin wetland habitat is critical for inanga spawning and important for several other whitebait species including giant kokopu.

[1] Hamill, K. 2014. Kaituna River Re-diversion Project: Ongatoro/Maketū estuary condition and potential ecological effects. Prepared for Bay of Plenty Regional Council.

[2] Owen, K.L., Wilson, T.D., Latham, P.M., Young, K.D. 2006. Distribution and conservation of shorebirds in the Bay of Plenty, New Zealand, 1984-2003. Technical report series 26. Department of Conservation.

40. Inanga spawn on the river margin vegetation and/or wetland species that occur between the upper surface limit and bottom limit of saltwater intrusion during spring tides; the loss of much of the vegetation suitable for spawning within the Estuary, especially at the zone of upper spring tide extent, is likely to have greatly reduced inanga breeding success in the Kaituna – Maketū area. The total whitebait catch, estimated by government officers at 2900kg per year in the 1930's, was reduced to approximately 75kg by 1984. Very little habitat suitable for inanga spawning remains within the Estuary (although suitable rearing and feeding habitat does remain), and only a small area on the Kaituna River opposite the Kaituna wetland has vegetation suitable for spawning at the upper spring tide zone.

41. Giant kokopu also spawn in wetland vegetation in swampy wetlands and streams that feed into estuaries. The loss of the wetland vegetation within and adjacent to the Estuary over time will have reduced the suitability of this area for this species.

42. The remnant salt marsh areas (mostly adjacent to Maketū Road) and wetland areas on the Titchmarsh land at the upstream end of the proposed new channel have significant ecological value for native fish.

43. Salt marsh and freshwater wetlands provide highly productive habitat for aquatic and terrestrial invertebrates. The substantial reduction of these areas since 1956 will have reduced the invertebrate populations accordingly.

**POTENTIAL ECOLOGICAL EFFECTS OF THE PROJECT ON VEGETATION AND HABITAT**

44. The re-diversion of Kaituna River flow into the Estuary will cause a range of physical and chemical changes to the Estuary and its environment that will generate potential effects (positive and negative) on estuarine margin vegetation and the biota that live in and/or rely on that vegetation.

45. The potential physical and chemical changes to water quality that will occur within the Estuary and lower Kaituna River as a result of the Project have been predicted by DHI (2014) using mathematical modelling. The modelling projections form the basis of my analysis of effects.

46. In addition to the changes to the aquatic environment, considerable changes on the land around the Estuary will occur. These will be associated with removal of the stopbanks and causeways, excavation of the new channel to link the river to the Estuary, in-filling of part of the existing channel between river and Estuary, and revegetation of the Brain land and Papahikahawai Island.

47. None of the physical and chemical changes likely to occur as a result of the Project are expected to have other than minor adverse effects on the remaining salt marsh areas within the Estuary.

48. A decline in less salt tolerant species along the northern edge of the Titchmarsh wetland, and an increase in more salt tolerant species, especially sea rush, is likely. However, the northern river edge of the wetland is dominated by salt tolerant species and it is expected that these species will prevail when the salinity levels rise. Consequently, wetland vegetation collapse (ie. reasonably rapid plant mortality without corresponding natural replacement by alternative native species) is not expected to occur as a result of the Project.

49. Occasionally large spring high tides will push salt water onto the land between the Titchmarsh wetland area and Ford Island, however, this area of land is sufficiently above mean high tide level to prevent regular tidal intrusion. This area has a higher proportion of less salt tolerant species so if the wetland soil conditions become more saline, due to occasional spring tide intrusion and/or elevated salinity on the shallow groundwater, then there may be a change in species composition to those more tolerant of salt water. Vegetation collapse is not expected in this zone and it is also considered unlikely that there will be other than minor changes in vegetation composition however contingency mitigation measures are proposed later in case significant salt-induced dieback does appear to be occurring.

50. The vegetation on Ford Island may change slightly, with a small improvement in species diversity and percentage cover likely on the eastern edge.

51. The predicted increases in nitrogen and phosphorus concentrations in some parts of the Estuary after re-diversion are unlikely to impact negatively on any estuary margin vegetation; in fact, it is conceivable that moderate increases in nutrient concentrations may benefit marshland/wetland plant growth, promoting productivity.

52. The salt marsh species alongside Maketū Road have persisted in relatively high nutrient conditions prior to and since the river diversion; with no projected change in nutrient status in this area, these can be expected to thrive in future.

53. The removal of livestock from both the Brain land and Papahikahawai Island can be expected to reduce the input of both nitrogen (especially in the form of soluble nitrate) and phosphorus loads entering the Estuary from these locations. Residual nutrient loads arising from the farmed areas can be expected to fall away within a few years of destocking.

54. Some concerns have been expressed by the Maori owners of Papahikahawai Island that the low-lying wetland area along the south side of island might be at risk of erosion and loss to the Estuary if the stopbanks are removed. From an ecological perspective, removal of the stopbanks and creation of a natural ecotone from estuarine sand flats through estuarine wetland, palustrine wetland and into terrestrial vegetation would maximise the benefits of the Project. Because there is some uncertainty about how significant the risk of accelerated erosion might be, postponement of the removal of the stopbanks on the island is recommended until a better understanding of the impact of re-diversion on erosion is obtained. Monitoring, management and restoration recommendations have been proposed later in this evidence that will enable a better understanding of the risks to be developed before any stopbanks are removed and ensure a precautionary approach is taken if and when the stopbanks are removed.

55. Changes to salinity and removal of the stopbanks in the north-western corner of the Estuary may create conditions suitable for salt marsh species to establish naturally or be replanted; a positive effect.

56. The increase in current velocity and increase in erosion potential predicted in the area south of Papahikahawai Island (where the 60 ha area of salt marsh / wetland existed pre river diversion) may prevent the re-establishment of a sedge–rush wetland in this area, whether through natural re-establishment, managed restoration or a combination of these two processes.

57. Relatively small mangroves have occurred within the Estuary in reasonably low numbers as far back as the mid 1800's. The Project is unlikely to create conditions more favourable to the growth of mangroves than at present. Sediment loads would need to increase substantially to greatly improve the suitability for mangroves.

58. None of the changes predicted to follow the proposed re-diversion of the Kaituna River are likely to have any adverse effects on the vegetation growing on Ongatoro / Maketū Spit. The composition of sedge/rush vegetation growing along the junction between the terrestrial dune vegetation and the estuarine margin vegetation may change in response to changes in water chemistry, especially at the western end. No other effects are predicted.

**POTENTIAL ECOLOGICAL EFFECTS OF THE PROJECT ON AVIFAUNA**

59. There are no predicted biological, physical or chemical changes to the Estuary that will occur with the Project that are likely to have adverse effects on the existing shorebird and wader populations other than the possibility of disturbance from increased human usage of the Estuary if the state and extent of the shell fishery improves.

60. DHI modelling predicts that the Project will generate increased residual current velocities towards the ocean and Hamill (2014) predicts this change should have a positive effect on benthic invertebrate fauna by "improving the rate of food supply for filter feeders such as cockle and by reducing the extent of the Estuary that is currently degraded by accumulations of free floating algae and anoxic muds". He expects the improvements will be most apparent in the upper Estuary, mid-Estuary south of Papakahawai Island and the lagoon area to the west of the island. He also predicts that the likely salinity changes will have little impact on benthic invertebrate fauna. The consequence of this is a likely improvement in the extent and quality of feeding grounds for waders and shorebirds; a positive effect.

61. Periodic breaches of the Maketū spit can reduce the area of suitable breeding habitat for species that occupy dunes and beaches, such as Northern NZ dotterel. Spit breaches are a natural occurrence at Maketū and several have been recorded since the 1860's. Evidence provided by other experts concludes that the Project is expected to increase the short term likelihood of spit breaches during flood events but the reduction in the flood tide delta over time should reduce the likelihood of them occurring into the future. If breaches do occur this may have a temporary effect on those species breeding on the dunes (they would temporarily relocate to other suitable beaches such as Herepuru, Pukehina, Matakana Island and Rangiwaea Island).

62. The remaining small areas of salt marsh within the Estuary are not expected to deteriorate as a result of river re-diversion and so the small numbers of birds utilising these areas should not be affected in any negative way by the Project.

63. There is some risk of species composition change and possibly wetland decline at the Titchmarsh wetland as a result of predicted salinity increases in the Kaituna River. If the wetland area was to retreat, the area available as habitat for wetland bird species would also decline. However, the restoration of up to 27.5 ha of wetland habitat will substantially increase the area of habitat available for wetland birds and more than compensate for any decline in the Titchmarsh wetland should that occur.

64. Construction activities associated with the excavation of the diversion channel and deposition of the excavated sediment are likely to result in feeding birds moving away from the construction area temporarily but no permanent effects are expected.

65. The formation of the new channel alongside the Titchmarsh wetland will not cause damage to wetland breeding habitat but construction activities may cause birds to choose nesting sites away from the southern edge of construction activity if construction occurs during the breeding season. Any effect of this nature will be minor provided the construction zone is

clearly delineated and the movement of construction machinery and workers is restricted to the construction zone only.

**RECOMMENDED MITIGATION OF EFFECTS ON VEGETATION AND AVIFAUNA**

66. Only minor or negligible effects are expected on the terrestrial and estuarine vegetation and on the avifauna of the Estuary and their habitat. However, I have proposed conditions requiring monitoring and mitigation as a preventative measure, and to confirm whether the predicted site condition changes have occurred. These recommendations have been included in the proposed consent conditions.

67. The potential changes in species composition in the Titchmarsh wetland due to increased Kaituna River salinity is one effect of the Project that should be closely monitored and may benefit from preventative mitigation. The likelihood of plant decline in this wetland is considered to be low. However, it is recommended that the vegetation composition and spatial extent of the wetland, especially along the margins, is surveyed in more detail prior to river re-diversion and closely monitored thereafter. I agree with proposed Condition 31.5 which requires this area be monitored 6 monthly for a period of two years following commissioning.

68. It is also recommended that contingency provisions are made in the Wetland Restoration Plan for replacement / enhancement planting with salt tolerant wetland species in areas where wetland plants are dying or showing signs of ill-thrift. I note that I have suggested that the title be amended to “Wetland Restoration Plan” as I think this more accurately reflects the purpose of the Plan.

69. The risk of erosion of the southern edge of Papahikahawai Island following the removal of the stopbanks is not clearly understood. Consequently, it is recommended that permanent water depth monitoring poles should be established at several locations along the southern coast of the island, and regular monitoring of water depth and erosion undertaken after re-diversion and prior to any attempt to remove the stopbanks to better understand the magnitude of the potential effects.

70. If it is decided to proceed with complete or partial removal of the stopbanks then it is recommended that the material contained in the stopbanks should be used to elevate the height of the land on the most low-lying sections of the island and to reduce the depth of the Estuary margins. This should reduce the impact of erosion arising from tidal action and increased Estuary channel current.

(i)

71. While the modelling information and knowledge of the historical biological changes within the Estuary enable post re-diversion predictions about biological effects to be made with reasonable confidence, it is recommended that all significant vegetation in and around the margins of the Estuary should be monitored at regular (annual) intervals for several years following the re-diversion to confirm that the predicted effects (or lack of them) are occurring. This will enable corrective interventions to be considered before any unpredicted effects advance too far.

72. The permanent vegetation transects and quadrats established by Opus in February - March 2014 have been established in locations to enable changes to be monitored at regular intervals. It is recommended that further transects are established on land that was previously not accessible, especially the Brain land, and land that may have been determined to be a greater risk of change, notably the Titchmarsh wetland and the southern edge of Papahikahawai Island. It is also recommended that similar transect lines should be established in the areas where active revegetation takes place. This requirement is set out in proposed Condition 31.

73. While only minor effects, at most, are expected on wetland birds if construction takes place during the breeding season, it is recommended that wherever construction works are to occur immediately beside any area of wetland that the works zone be kept to the minimum size possible and be clearly marked in the field. Every effort should be directed at ensuring that construction machinery and workers do not move beyond the delineated construction zone.

74. Bird surveys to monitor any adverse effects of the construction works and Project were considered and discussed at the caucusing I attended with PDP. However the absence of statistically robust baseline bird data means that it would not be possible to compare post re-diversion bird abundance in any statistically significant way that would enable effects of the Project to be differentiated from natural and other environmental effects. Adverse effects on the birds of the Estuary and its margins as a result of the Project are expected to be negligible so the inability to monitor change is not considered to be a risk.

**WETLAND RESTORATION PROPOSAL**

75. The Kaituna River Re-diversion and Ongatoro / Maketū Estuary Enhancement Project has as one of its aims the restoration of at least 20 ha of wetland around the Estuary margins. The Brain land, the southern low-lying flats of Papahikahawai Island, and the portion of Ford's Loop Channel that is to be filled are areas identified for restoration. All of these areas were wetland habitat prior to drainage and development for farming. The availability of the Brain land is subject to negotiation of a purchase agreement between Bay of Plenty

Regional Council and the landowners, and the restoration undertaken on Papahikahawai Island is at the discretion of the Maori landowners (being separately discussed through a Biodiversity Management Plan process).

76. The Project will re-establish freshwater, estuarine margin and saltmarsh wetlands where environmental conditions allow once the Kaituna River is re-diverted. The species chosen for planting and the wetland types created will be governed particularly by the nature and extent of tidal influences, soil salinity, and soil saturation that occur after stopbanks and causeways are removed.

77. After consideration is given to matching species tolerance ranges to the site conditions, effort will be made to create habitat at appropriate locations for important/threatened fauna. For example, creation of increased areas suitable for inanga spawning is considered to be a priority, as is the establishment of wetland habitat suitable for breeding for threatened marsh species such as North Island fernbird, marsh crake and Australasian bittern.

78. Because the growing conditions will change more on some parts of the wetland restoration areas than others after re-diversion, a restoration strategy will need to be produced that includes the following:

    (i) Initial monitoring of site growing conditions (especially soil salinity, soil saturation, tidal induced sediment erosion and deposition);

    (ii) Creation of a planting zone plan based on site growing conditions and species tolerances;

    (iii) Trial planting of plant species especially in areas where growing conditions are likely to be challenging (eg. areas exposed to open tidal water and those with higher salinity);

    (iv) Details of mass planting once species can be matched to site conditions with high confidence of success.

79. This restoration strategy is designed to reduce the risk of large-scale and expensive planting failure. Low risk locations, such as those on the terrestrial sites well above tidal influence on the Brain land and Papahikahawai Island, can be planted without need for initial trial plantings, whereas some of the wetland areas on Paphikahawai Island may not be planted for several years after re-diversion until erosion risk has been evaluated and a decision has been made about whether the stopbanks should be removed and how rapidly they should be removed.

80. The removal of the causeways and stopbanks will result in re-flooding or increased ground saturation of substantial sections of the Brain land and the low-lying sections of Papahikahawai Island. The extent to which these land areas become re-wetted and the level of soil salinity created by opening this land to the tide will determine the range of plant species that can be re-established.

81. Each of the three wetland restoration areas will require different restoration plans that reflect land ownership and the environmental conditions and risks that will arise following the river re-diversion. Each plan will have different planting zones, species mixes, plant spacings, plant grades, site preparation.

82. Trial plantings are recommended on the Brain land prior to any mass plantings to ensure species tolerances are well understood and well matched to monitored soil conditions. These trial plantings will provide information that will allow species to be selected for planting at all 3 wetland sites.

83. Once mass planting begins, each area planted will need to be maintained and any plant mortality replaced, for a 5 year period following planting.

84. Wetland restoration details and recommendations are contained in my Assessment of Environmental Effects report (MacGibbon 2014),[3] and further detail will also be contained within the proposed Wetland Restoration Plan, required as a condition of consent.

85. Mangroves have been proposed as a species that might assist in the reclamation of some of the Estuary. Attempts to plant mangroves to control erosion have occurred at a number of New Zealand locations but without any great success. The general conclusion is that if suitable environmental conditions for mangroves are present then the species will more than likely occupy those areas naturally. Their failure to thrive and spread in most parts of the Estuary in the past would suggest that conditions do not favour them (although there is evidence that some people actively remove seedlings from parts of the Estuary) but this may change with the Project. Eel grass or seagrass beds have almost disappeared from the Estuary. By decreasing the salinity through the mid-Estuary in the elevation ranges potentially suitable for eel grass, the Project will make conditions more suitable for the re-establishment of eel grass beds, either by natural or restoration planting means.

86. No adverse effects are expected on the existing ecology as a result of the restoration of the wetland areas. On the contrary, substantial beneficial effects are anticipated. The diversity and abundance of indigenous plants and animals will increase substantially as a

[3] MacGibbon, R. 2014. Kaituna River Rediversion & Ongatoro/Maketu Estuary Enhancement Project: Terrestrial, Avian and Wetland Restoration Ecology, Assessment of Environmental Effects. Opus International Consultants.

result of the increased area of high value habitat and increased biological productivity. Aspects of water quality may also improve as a result of the removal of grazing livestock from the Estuary margins and the nutrient trapping and extraction capacity of healthy functioning wetlands.

**RESPONSE TO SUBMISSIONS**

87. I have considered the submissions that have raised issues relating to the scope of my role in the Project.

88. The Maketu Ongatoro Wetland Society propose the installation of a cattle grid and pest proof fence extensions at the “southern end of the culvert barrage” which they believe will help prevent incursions by both domestic animals and pest species. The restored wetland areas will be well protected from livestock by fencing and removed causeways so a cattle grid is probably unnecessary to achieve effective exclusion. The most problematic predators will be those that feed on birds, especially ferrets, stoats and rats, and their numbers can be expected to rise as habitat increases and more birds choose to breed in the wetlands. On-going pest control of bird predators will be necessary to improve bird survival and aid population growth but because stoats and rats are nimble and good swimmers more conventional pest control measures (ie. regular baiting) are likely to achieve better results than a cattle grid and extensions of pest proof fences.

89. Western Bay of Plenty District Council have proposed that the maintenance period for the wetland restoration plantings be extended to 10 years to account for the trial planting period and the likelihood that the mass plantings will be staggered over several years. It is intended that each zone planted (ie. one year’s planting) will be monitored and maintained for no less than a 5 year period which I consider to be sufficient to determine the success of that planting.

90. Chris Richmond refers to the need for adaptive management principles to be accommodated in the conditions to provide sufficient flexibility to adapt the restoration plantings to suit the environmental conditions that occur post-diversion. I agree completely and believe the approach to the restoration as outlined in my evidence and proposed in the conditions allows for that flexibility.

91. In his submission, Eion Harwood has suggested that the increased impact of people and dogs on the new wetland areas will create increased disturbance to the bird populations. Both people management (eg. by construction of well-formed tracks) and dog management (ie. possibility of dog exclusion) will be necessary to optimise the growth of wetland bird populations in the new wetlands, but even with some increase in human activity the great

increase in habitat and the expected sizeable growth in bird numbers should result in a significant net gain from an ecological perspective.

92. Lisette Collins questions whether the ecological values to be gained by the Project will be as substantial as stated in my terrestrial and avian Assessment of Environmental Effects report and that of Keith Hamill on the estuarine values. I have no doubt that the addition of a large area of new wetland habitat will be of substantial ecological value providing habitat for wetland bird species and invertebrates that is scarce in the wider environment. More breeding and feeding habitat will lead to more wetland birds, many of which are nationally threatened. Mr Hamill comments on the value of the Project in terms of estuarine ecology.

93. I note the submission from the Te Puke Branch of the Royal Forest and Bird's Society which offers its full support for the re-diversion and wetland restoration.

94. Te Tumu Landowners Group, Te Tumu Kaituna 11B2 and 14 Trusts, and Ford Land Holdings Pty Ltd refer in their submissions to the need to give regard to the New Zealand Coastal Policy Statement 2010 (NZCPS) and in particular Policy 11 Indigenous biological diversity (biodiversity): To protect indigenous biological diversity in the coastal environment. While not specifically mentioned in my ecological assessment I acknowledge the relevance of the NZCPS and believe all aspects of this project are consistent with it. Policy 11 (a) refers to the need to avoid adverse effects on threatened or at risk indigenous taxa, indigenous ecosystems and vegetation types, and Policy 11 (b) states "*avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:*

    (i) *areas of predominantly indigenous vegetation in the coastal environment;*

    (ii) *habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;*

    (iii) *indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh".*

95. No adverse effects on threatened biota, habitat or ecosystems are predicted, and no significant adverse effects are predicted on terrestrial and avian coastal ecology as a result of the Project. Where minor adverse effects may occur, the proposal to restore a large area of wetland habitat is considered to be more than appropriate mitigation for those effects.

**SECTION 42A REPORT**

96. The Officers' Report generally endorses my assessment of effects of the Project on the terrestrial and avian ecological values of the Estuary, including Conditions 28 and 29 as proposed by the Applicant.

97. Additional conditions 11.4 (g) and 11.5 (e) are proposed by the Reporting Officer to safeguard the habitat and fauna residing in the Titchmarsh Wetland. I am in agreement with those additional conditions.

98. The Officer's Report proposes the inclusion of a requirement or objective for "no less than 19 hectares of wetland". I agree that there is a need for a commitment to attempting to restore a minimum area of wetland habitat, and the Project objective is to endeavour to restore 20 ha or more. However, there is a risk, albeit very small in my opinion, that small sections of the land proposed for restoration may not sustain wetland vegetation because environmental conditions after re-diversion are not suitable for salt marsh or freshwater wetland plant species. If this should occur, then it might not be possible to create all of the 20 ha of wetland desired on the land available.

**CONCLUSION**

99. I consider the Project will result in a net positive effect on vegetation, habitats and avifauna around the Ongatoro / Maketū estuary. I have proposed monitoring that will confirm the extent of these positive outcomes, and which will also ensure at the same time that any adverse effects, if they arise, can be identified and addressed.

Roger MacGibbon

17 April 2015