

BEFORE THE AUCKLAND UNITARY PLAN INDEPENDENT HEARINGS PANEL

IN THE MATTER of the Resource Management Act  
1991 and the Local Government  
(Auckland Transitional Provisions)  
Act 2010

AND

IN THE MATTER of Topic 081b Rezoning and Precincts

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STATEMENT OF REBUTTAL EVIDENCE OF ANDRES ROA  
(STORMWATER) ON BEHALF OF THE LONG BAY - OKURA GREAT PARK  
SOCIETY INCORPORATED AND THE OKURA ENVIRONMENTAL GROUP

26 FEBRUARY 2016

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## 1 INTRODUCTION

- 1.1 My full name is Andrés Roa. I hold a Bachelor of Engineering degree from the Javeriana University in Bogotá, Colombia.
- 1.2 I am an Engineering Consultant. I hold membership of the Institute of Professional Engineers New Zealand (IPENZ) and Chartered Professional Engineer (CPEng) and International Professional Engineer (IntPE) status.
- 1.3 I have approximately twenty years' experience in the field of Civil Engineering. I am currently a director of AR & Associates Ltd, a civil engineering consulting firm based in Takapuna, Auckland.
- 1.4 I have acted as a civil engineering consultant to a wide range of clients in both the public and private sectors throughout New Zealand. I have considerable experience in the stormwater, wastewater and water supply fields, having been responsible for the design and supervision of many civil engineering projects.
- 1.5 For the last ten years I have acted as a stormwater management consultant for the Auckland Council (and the legacy councils), where I have been responsible for undertaking technical review of numerous stormwater-related consents throughout the Auckland Region, and more recently the technical review of Special Housing Area applications on behalf of the Stormwater Unit (for the Housing Project Office) and Development Engineering.
- 1.6 In addition, since 2008 I have been responsible for the feasibility planning and design of a considerable number of stormwater projects for Auckland Council, involving stormwater quality, quantity and addition to flood management works. My work has also included the design and delivery of stormwater modelling training courses to industry and tertiary institution entities on behalf of Council.
- 1.7 I have also been responsible for the engineering design and supervision of a number of land development and residential subdivision proposals such as the ones discussed in this statement of evidence, including stormwater, wastewater, water supply and roading elements.
- 1.8 In preparing this rebuttal statement I have read the evidence prepared in relation to Okura by the following parties:

### Okura Holdings Ltd

- Karl Cook (Planning)
- Malcolm Green (Stormwater / Sediment)

Bin Chen et al (Okura Rural Land Owners Group)

- Michael Lee (Engineering)
- Burnette Macnicol (Planning)
- Dean Craig Miller (Ecology)
- Dr Timothy Simon Richmond Fisher (Stormwater / Sediment)

Auckland Council

- Martin William Neale (Freshwater Ecology)
- Shona Claire Myers (Ecology)
- Dr Claudia Hellberg (Stormwater)
- Nicholas Vigar (Stormwater)
- Austin Daniel Fox (Planning)

Long Bay Okura Great Park Society/Okura Environmental Group

- Christina Bettany (Lay Evidence)
- Alan Webb (Legal Synopsis)
- Peter Dean Reaburn (Planning)

1.9 I also attended the Ecology and Stormwater Expert Conference held on 15<sup>th</sup> October 2015 in respect of Topic 016 RUB North / West.

1.10 I have read and understand the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and agree to comply with it. This evidence is within my area of expertise, except where I state otherwise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this statement of evidence.

## **2 BACKGROUND AND SCOPE**

2.1 The focus of my rebuttal evidence is on the potential stormwater and sediment related effects from urban development and intensification in the Okura Estuary catchment, as proposed by Okura Holdings Ltd (OHL) and Bin Chen et al - Okura Rural Landowners Group (ORLG).

- 2.2 In particular, my rebuttal considers the evidence of Burnette Macnicol on behalf of ORLG and Karl Cook on behalf of OHL for Topic 081b Rezoning and Precincts (Geographical Areas) and the background to their evidence as detailed in Topic 016 RUB. The development proposals for these submitters are described in detail in evidence presented by Ms Macnicol and Mr Cook for Topic 016.
- 2.3 The Okura Estuary is part of the Long Bay-Okura Marine Reserve, and has an SEA Marine 1 classification, which clearly demonstrates the sensitivity of the receiving environment. This means that the protection of these environments in respect of stormwater, sediment and other effects that may result from urbanisation is a high priority.
- 2.4 Mr Miller in his statement (Para 12) on behalf of Bin Chen et al states that “smaller streams near the centre of the subject area are of lower quality reflecting more recent land use pressures and lower level of riparian protection.” This effectively acknowledges that the existing stream network is already under stress. Further intensification will in my opinion exacerbate these impacts, due to the increase in earthworks and the creation of additional impervious surfaces.
- 2.5 A submission on the Proposed Auckland Combined Plan has also been made by Weiti Development LP and Green and McCahill Holdings Ltd in respect of urbanisation and intensification proposals for the Weiti area, north of the Okura Estuary. Evidence however has not been submitted by these parties and I have therefore not covered this submission in this statement of rebuttal.
- 2.6 In this rebuttal evidence I comment on the evidence and rebuttal evidence as submitted to the Independent Hearings Panel regarding the proposed re-zoning of Okura by Council and submitters, OHL, ORLG and the Long Bay - Okura Great Park Society/Okura Environmental Group, in regard to:
- Stormwater contaminant management and related effects
  - Stormwater management design and applicability of Water Sensitive Design (WSD)
- 2.7 I have mainly focussed my comments on the evidence presented by Ms Macnicol, Mr Miller, Dr Fisher, and Mr Lee (on behalf of Bin Chen et al and ORLG), Dr Malcolm Green and Mr Cook (on behalf of OHL), and Messrs Neale and Vigar and Dr Hellberg (on behalf of Auckland Council).
- 2.8 As a general statement, based on the evidence and submissions reviewed, I do not believe there is sufficient information to support OHL’s and ORLG’s intensification proposals.
- 2.9 Ms Macnicol states (Para 29) *“The superior stormwater management, vegetation removal and public access provisions secured by the Okura Precinct will ensure that*

*natural and physical resources, as well as the life supporting capacity of water and ecosystems, are better protected by the proposed zoning than the Countryside Living zoning.”*

- 2.10 I do not consider that this is the case because in my opinion the proposal as it stands is likely to result in inferior stormwater management outcomes with regard to accumulation of sediments and heavy metals (in the context of the sensitive receiving environments), and practices that are not in keeping with WSD principles. I have provided a detailed explanation of my consideration of ORLG’s proposal below.
- 2.11 Mr Cook’s evidence (Para 28) states, *“The modelling carried out by NIWA and addressed in evidence on Topic 016 relied on assumptions about, among other things, heavy metal inputs. To ensure the outcome of urbanization of the OHL Okura land is consistent with the modelling a non-complying activity rule for high contaminant yielding materials is proposed in Activity table 1. The proposed rule is more onerous than the equivalent rule in the stormwater quality section of the PAUP and is necessary and appropriate in my view to achieve the particular outcomes sought given the Okura Estuary receiving environment.”*
- 2.12 While I agree with Mr Cook that placing limitations on high contaminant yielding materials is desirable, based on the background presented on Topic 016 I disagree that from a heavy metal contaminant management perspective, the information has sufficiently shown that desirable outcomes can be achieved on the Okura Estuary if the development goes ahead as proposed. I have provided below a detailed explanation on my position with respect to sediment and heavy metal accumulation in the Estuary.
- 2.13 Mr Cook goes on to say (Para 29) *“As addressed in ..... a WSD approach has been integrated into the structure plan process that has been carried out and can continue to be implemented in the next design phases of master planning and subdivision. .... In my view these additional measures in the Okura Precinct provisions will best ensure the particular outcomes sought on the OHL Okura land given the particular circumstances of the adjacent Okura Estuary.”*
- 2.14 I disagree with Mr Cook’s statement as I do not believe that WSD practices are able to be fully realised for a medium density residential development such as is proposed by OHL, and in the context of the existing topography and stream network within the OHL Okura land. I have provided below a detailed description of my position with regard to WSD.
- 2.15 Mr Cook states in his evidence (Para 52), *“... As addressed in Graeme Ridley’s evidence in Topic 016, significant advancements in the control of silt and sediment runoff have occurred over the past decade. These controls required by Auckland-wide rules and augmented by precinct provision including Rule 6.2 as noted above,*

*included technological advancements, including chemical treatment of stormwater ponds which have significantly improved the efficiency of the proportion of silt that these devices keep from receiving environments. Management practices, including maintenance of ponds and prediction of severe weather events, have also improved. As a result the state of the receiving environment is able to be preserved and adverse effects avoided as set out in the Topic 016 ....”*

- 2.16 While I agree with Mr Cook’s statement that there have been significant advances in erosion and sediment control technologies, I don’t agree that the evidence presented in Topic 016 provides sufficient information to conclude that the receiving environment will be able to be preserved or adverse effects avoided. I have provided below a detailed explanation on my position with respect to sediment and erosion control and sediment and heavy metal accumulation in the Estuary.

### **3 STORMWATER CONTAMINANT MANAGEMENT AND RELATED EFFECTS**

- 3.1 Further explanation on my position described above on Ms Macnicol’s and Mr Cook’s evidence, in the context of stormwater contaminant management and related effects, is provided in Paragraphs 3.2 to 3.18 below.
- 3.2 Dr Fisher in his sediment assessment (Para 20, first bullet point) points out that event based sediment yields for the ORLG land will be less than estimated for the OHL land due to less intensive earthworks and smaller earthwork areas. I do not necessarily agree with this statement as this will also depend on the slope of the land, which on average appears to be steeper in the ORLG area compared to the OHL land, and the nature of the erosion and sediment control practices proposed. The ORLG land is characterised by comparatively steeper gullies and more direct routes feeding to the stream network and the Okura Estuary and Marine Reserve beyond, when compared to the OHL block.
- 3.3 Based on Mr. Lee’s evidence (Para 59) it appears that standard TP90 sediment retention ponds are the only measures proposed as the primary erosion and sediment control for the ORLG development, which provides a sediment removal efficiency of 70-75%. Paragraph 63 goes on to say that efficiencies can be as high as 95% with flocculation in place, but it is not explicitly stated whether flocculation is proposed. In my view, given the sensitivity of the coastal receiving environment and the progress gained in recent years in respect of erosion and sediment control practices and technologies, the implementation of mitigation measures that go beyond TP90 is warranted at Okura.
- 3.4 Additionally, Dr Fisher’s statement (Para 20, second and third bullet points) indicates that as a result of the development, the overall sediment load from the OHLG land is predicted to increase by 4%. Dr Fisher also notes that the load from

the wider Okura catchment is predicted to increase by 0.4% compared to the current scenario and assuming the existing land use is maintained.

3.5 Dr Fisher then goes on to say (Para 21) that on this basis, the effects of these increases on the Okura Estuary are “only very minor”. I disagree with this position due to the following reasons:

- The ORLG land (or any other discrete piece of land in the Okura Estuary catchment) cannot be considered in isolation when assessing effects on the estuary, and cumulative effects from potential development within all other parts of the catchment must be considered. In addition, the effects from adjoining catchments such as the Karepiro where Weiti Developments propose further development need to be considered.
- Regardless of how small the percentage of the overall increase sediment load from the catchment may be, any increase in sediment yield is still an increase, which will likely result in negative effects on the receiving environment. In my opinion, these effects cannot be fully understood based on the current evidence.

3.6 Dr Fisher in his statement (Para 24) indicates that ORLG relies on OHL’s interpretation of the NIWA models in respect of assessing the fate of the sediment in the Okura Estuary. I however note that NIWA’s analyses and findings were undertaken in respect of development taking place in the OHL land only, with the assumption that existing land uses would remain unchanged for the remainder of the catchment (which means the no development of the ORLG was allowed for in the models). I therefore do not agree with Dr Fisher’s statement as I do not consider that the NIWA findings present a full picture, and they cannot be relied upon to determine the effects arising from development of ORLG land or any other land beyond the OHL block.

3.7 In Para 35 Mr Miller states that adverse effects of sediment discharges are unlikely to be no more than minor due to the proposed sediment controls (being primarily limited to TP90 sediment retention ponds) as discussed in Mr Lee’s evidence. There appears to be no technical basis for this statement, particularly given that the development will result in a net increase in sediment yield compared to the existing scenario, and in view of the highly sensitive environments.

3.8 With regard to the hydrodynamic sediment transport model developed by NIWA, Dr Green in his main body of evidence (Para 7) states that two different types of model simulation were conducted. The first model simulation considered sediment yield from the OHL area only. As Dr Green himself acknowledges, under this modelling scenario the “*“sediment footprints” elucidated by these simulations can be thought of as partial*”. In my view therefore, these simulations cannot be not representative of the true sediment footprint resulting from the development,

given that there are sediment loads from other parts of the catchment that cannot be ignored.

- 3.9 Dr Green's second model simulation (Para 8) considered sediment yield from the catchment as a whole, and examined the sediment footprint with and without earthworks associated with the OHL development. Again, I do not consider that this model scenario can be used to accurately determine the predicted future sediment footprint in the Okura Estuary, as the model is based on the assumption that existing land use in the remainder of the catchment will remain unchanged and no other development will take place outside the OHL area.
- 3.10 In my view, in order to determine the true sediment and contaminant footprint in the Okura Estuary and associated effects, the catchment must be analysed as a whole and in account of all probable development taking place. In my opinion it is not possible to accurately determine any effects on the receiving environments if only one area of development is considered in isolation. As such I do not believe that the NIWA models, as they currently stand, can provide an accurate or reliable picture of contaminant accumulation in the estuary and the marine reserve, for purposes of assessing the effects.
- 3.11 Paragraph 17 and Figures 1 to 3 of Dr Green's body of evidence shows that sediment deposition thickness already occurring under existing landuse conditions reaches the top of the scale (at 0.5mm) in a number of areas for all storm events analysed (5, 25 and 100 year ARI). The "difference maps" in these figures in turn show that, with the exception of the 'treated' scenario in the 5 year ARI event, the additional sediment deposition arising from the OHL development results in sediment deposition that again reaches the top of the scale (at 0.5mm) for all scenarios analysed.
- 3.12 This would suggest that the combined sediment deposition could reach 1mm or more as a result of the OHL development alone, when accounting for current sediment loading. Again, given that this model only considers OHL in isolation, if any other development in the catchment were to take place then further increases in sediment deposition could result. The deposition levels that could arise from the remainder of the catchment when accounting for a full development potential could be significant, depending on the timing and types of erosion and sediment control measures proposed, and considering that the sediment yield from the OHL land constitutes only a small part of that which arises from the wider Okura Estuary catchment (Green et al).
- 3.13 As was done for the sediment deposition models, the metal accumulation study by NIWA appears to have also been based on the effects arising solely from the OHL development and in isolation from other potential development in the wider catchment. This study considers the scenario that the existing landuse in the



remainder of the Okura Estuary catchment (including the land where development is proposed by ORLG and other areas outside OHL), will remain unchanged.

- 3.14 Hence my conclusion above in regard to cumulative effects also holds true with respect to heavy metal (zinc and copper) accumulation effects.
- 3.15 Overall, the findings above highlight that no single development can be used in isolation when attempting to assess the extent and nature of the effects on the wider estuarine environments. This is also reflected in the conclusions in the joint statement by Mr Vigar and Dr Hellberg (paras 1.3 and 7.7), and is in my view a paramount consideration that must be taken into account in order to understand the true impacts, and an issue that has not yet been satisfactorily addressed through the NIWA modelling or any of the evidence presented by submitters.
- 3.16 Additionally, NIWA's sediment and heavy metal accumulation models predict that there will be a net increase in sediment and heavy metals within the Okura Estuary as a result of the development, regardless of the mitigation controls that may be proposed. NIWA's updated model (post 15 October 2015 expert conference) predicts the exceedance of green-amber levels for copper, and zinc levels that are marginally below green-amber levels. The results from these models in my view do not provide certainty the level and extent of the effects.
- 3.17 Further uncertainty is introduced when considering that the NIWA models are not calibrated, a concern that was also expressed by Mr Vigar and Dr Hellberg in their joint statement of evidence.
- 3.18 Finally, I note that the mass balance model that NIWA used to predict zinc and copper concentrations assume that sediment originating from parts of the catchment outside the development area carries no anthropogenic metals to the estuary. This assumption appears to be solely based on the Silverdale area and its location near the head of the catchment and away from the estuary, but seems to ignore other major (already consented) sources of metals such as the Northern Motorway and East Coast Road (plus other local roads), which are located relatively close to the areas of analysis. The Okura Township, which is very close to the area of analysis, is mentioned in the report but the effects also appear to be discarded. I therefore consider that the potential generation of anthropogenic metals from these areas is unlikely to be insignificant and should not be ignored in the analysis. This adds to the uncertainty level around the NIWA models, as acknowledged in Mr Vigar's and Dr Hellberg's joint statement of rebuttal evidence (Para 1.3(b)2).

#### 4 STORMWATER MANAGEMENT DESIGN AND APPLICABILITY OF WATER SENSITIVE DESIGN

- 4.1 Further explanation on my position described above on Ms Macnicol's and Mr Cook's evidence, in the context of stormwater management design and applicability of WSD, is provided in Paragraphs 4.2 to 4.8 below.
- 4.2 WSD is the integration of the water-cycle into urban planning and design, using or mimicking natural processes at source. From a stormwater management point of view, the purpose of WSUD is to maintain the hydrological characteristics of an area by maintaining, wherever possible, existing topography (through the minimisation of earthworks) and flow patterns and behaviours, using existing natural features such as streams and wetlands to avoid or reduce changes in runoff and to provide a stormwater quality treatment function before the runoff is discharged into the environment.
- 4.3 WSD also requires a multidisciplinary approach where stormwater is embedded into other design elements of a project such as urban design, landscape design and roading, during their planning, design, construction and operation and maintenance processes. It requires stormwater to be considered upfront and as an integral part of the design planning, rather than being dealt with in isolation or as an afterthought. The key focus is to manage stormwater on the surface and through its interaction with naturalized urban environment before it enters the pipe or discharges to the receiving environment.
- 4.4 As referenced by Mr Vigar and Dr Hellberg in their joint evidence (Para 1.7), in view of the extent of the permanent and intermittent streams and the topography of the OHL land (and in account of the re-assessment of streams undertaken following the 156 October 2015 expert conference), it is very unlikely that the OHL land will be able to support medium density residential development without considerable effects on these streams, as comprehensive earthworks would be required in order to realise the predicted yields.
- 4.5 Given these reasons and given the context on WSD given above, a development of this density would therefore strongly contradict WSD principles.
- 4.6 Mr Cook in his evidence (Para 20) states that for the OHL development, WSD will be implemented through the inclusion of a "water tank rule" and additional subdivision criteria. There is no mention of integrated design, retaining existing topography and hydrology, at-source controls, or initiatives around minimising earthworks or management of stormwater in a manner that recognises the natural environment. Again, this would appear to fall well short of promoting WSD principles.
- 4.7 Mr Cook goes on to say in paragraph 67a that there is an assumption by council that "Countryside Living zoning would result in environmentally good outcomes",

but that there is no evidence supporting this. While there cannot be any guarantee that Countryside Living zoning would result in a particular environmental outcome in relation to the existing situation, when compared to the prospect of development in the way and to the extent proposed by the submitters, the effect of retaining the Countryside Living land use is in my view comparatively positive. I base this statement on the information supplied through Topic 016 which as explained throughout this statement does not provide sufficient evidence to conclude that the increases in sediment and heavy metal accumulation will not result in adverse effects on the Okura Estuary and Marine Reserve. Additionally, as explained in Paragraphs 4.2 to 4.6 above, I also do not believe that the OHL development as currently proposed will support WSD design philosophies.

- 4.8 Mr Lee in his evidence (Para 71) states that the stormwater management design for the ORLG land will follow WSD principles, which is supported. There appears to be however no mention of whether infiltration will be considered to address stormwater retention objectives, which aim to protect stream health and maintain baseflows during dry periods, which I understand are the intentions of the PAUP. This again would appear to depart from WSD principles, which seek to maintain hydrology including natural infiltration processes and stream health.

## **5 CONCLUSION**

- 5.1 I disagree with the positions presented by Mr Cook and Ms Macnicol in regard to stormwater and sediment related effects from urban development and intensification in the Okura Estuary catchment, as proposed by Okura Holdings Ltd (OHL) and Bin Chen et al - Okura Rural Landowners Group (ORLG). The following matters are of particular concern.
- 5.2 The information presented by Dr Green in his evidence and the NIWA models provides only partial results in regard to sediment and heavy metal accumulation, as it only accounts for development in OHL land and appear to ignore other consented sources of stormwater contaminants, or potential for further probable development in the catchment. No other modelling information has been provided for other proposed developments in the catchment. As such in my view the modelling information presented to date models does not offer a reliable basis to assess effects on the Okura Estuary and the Marine Reserve.
- 5.3 The proposed stormwater management approach presented in respect of the OHL and ORLG proposals does not offer an acceptable level of confidence that opportunities to implement WSD practices will be fully utilised. This could result in effects that are less than optimal from a stormwater and sediment perspective, given the sensitivity of the receiving environment.

- 5.4 Due to the reasons given above, I do not support OHL's and ORLG's intensification proposals, and consider that if implemented to the extent and in the manner proposed, they do not guarantee that adverse effects on the riparian areas, Okura Estuary and the Marine Reserve will be avoided.

**Andrés Roa**

Civil Engineer

26 February 2016