IN THE MATTER: of the Resource Management Act 1991 (**RMA**)

AND

IN THE MATTER: of Proposed Plan Change 93 (Te Puna Springs) to the Western Bay of Plenty District Plan under Schedule 1 of the RMA.

STATEMENT OF EVIDENCE OF SUSAN IRA

1 July 2022

INTRODUCTION

Qualifications and experience

1. My full name is Susan Jean Tyson Ira.

2. I am the Founding Director of Koru Environmental Consultants Ltd. I have a Master of Science in Environmental and Geographical Science from the University of Cape Town in South Africa.

3. I have over 20 years' experience working in urban stormwater management, stormwater treatment, catchment management, water quality policy development, water quality consent review, life cycle costing of stormwater management, water sensitive urban design and green infrastructure.

4. I have specialist expertise in water quality treatment approaches, water sensitive design and green infrastructure. I came to New Zealand in 2003 and worked as a stormwater consent processing officer for the former Auckland Regional Council before becoming the manager of their stormwater consents and compliance team. In 2007 I founded Koru Environmental Consultants Ltd.

During this time, I have undertaken numerous stormwater and water quality technical consent and plan change reviews for Auckland Council, Bay of Plenty Regional Council, Greater Wellington Regional Council and Environment Canterbury. I have provided training on Auckland Council and Waka Kotahi's stormwater management guidelines nationally, and have also developed and provided national training for Water New Zealand on advanced stormwater management and water sensitive design. I am one of three New Zealand based trainers to have provided training to the stormwater community for the International Certification Programme for Green Infrastructure. Other recent projects I have been involved in include:

4.1 Technical Science Lead for water quality planning for the Lake Waikare and Whangamarino Wetland on behalf of Waikato Regional Council.

4.2 One of four lead researchers on "Activating Water Sensitive Urban Design" in New Zealand jointly with NIWA, Manaaki Whenua Landcare Research and Batstone Associates for the National Science Challenge for Building Better Homes Towns and Cities.

4.3 Development of a life cycle cost model for urban stormwater quality mitigation interventions for Auckland Council's Freshwater Management Tool.

4.4 Undertaking a review of Auckland Council's contaminant load model, used for modelling contaminant loads from urban development and the efficacy of various treatment devices to reduce water quality effects on freshwater streams.

5. My evidence is given in support of the Bay of Plenty Regional Council submission and pertains to the stormwater treatment approach recommended to mitigate water quality effects from areas which would be rezoned as commercial as part of the proposed Te Puna Springs PC93 structure plan change. I confirm that I have read all the relevant documentation.

6. My evidence should be considered together with the evidence of **Mr Nathan Te Pairi**, **Ms Kathy Thiel-Lardon, Mr Mark Ivamy** and **Mr Keith Hamill**.

7. I have read the Code of Conduct for Expert Witnesses (Code) in the Environment Court Practice Note (2014) and agree to comply with the Code. I confirm that this evidence is within my area of expertise, except where I state that I am 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.

Scope of evidence

8. My evidence will deal with the following:

   8.1 Effects of commercial development on freshwater receiving environments.

   8.2 Water Sensitive Design (WSD)

   8.3 Efficacy of the proposed stormwater approach in PC93 to avoid remedy or mitigate water quality effects.

   8.4 Response to the Officer's Report.

   8.5 Response to the Applicant's evidence.

   8.6 Recommendations and outcomes sought.

EFFECTS OF COMMERCIAL DEVELOPMENT ON FRESHWATER RECEIVING ENVIRONMENTS

9. Urbanisation creates impervious surfaces which reduce infiltration of water into the ground, reduce evapotranspiration of water by plants into the atmosphere and increase the volume of run-off which is discharged to the receiving environment. In addition, impervious surfaces have contaminants (or pollutants) on them which become entrained in stormwater when it rains and, without treatment, these contaminants can be directly discharged to the receiving environment.

10. This leads to three key effects from stormwater management, namely: increased flooding, a decline in water quality, and effects on aquatic habitats both from an increase in the volume of water discharged and the poor water quality.

11. Commercial developments generally require large areas of impervious surface (often >70%) and, depending on the nature of the activity, can be considered high contaminant generating surfaces. Key contaminants of concern from commercial areas include sediments, metals (such as zinc, copper and lead), hydrocarbons and temperature.

12. Sources of metals: The key source of zinc in urban areas is the use of roofing materials such as galvanised steel or zinc alloy type roofs[1]. Every time it rains, dissolved zinc will leach from these building materials and become entrained in the stormwater. Unpainted galvanised roofs can lead to total zinc loads of ~2.24g/m^2/year versus an inert roofing material (such as colour steel or concrete tiles) which lead to total zinc loads of ~0.02g/m^2/year[2]. Copper is widely used in the manufacture of alloys with zinc. Lead is less of a concern nowadays given that most paints are now lead free and lead is no longer contained within petrol. Other sources of zinc and copper are from vehicles (in tyres and brake pads) on roads and in parking areas. Trafficked areas where vehicles are slowing down, turning, parking and speeding up represent high contaminant generating areas due to tyre and brake-pad wear and tear.

13. Water temperature is a fundamental variable which affects the distribution, growth, metabolism, behaviour and survival of aquatic organisms[3]. Stream temperatures are affected not only by the clearance of riparian vegetation (which shades and cools streams) but also possibly by the discharge of warm water from detention ponds and by warm-water runoff from impervious surfaces such as roads, roofs and paving. report that lethal temperatures for 12 New Zealand invertebrate species ranged from 22.6°C for sensitive species, to 32.6°C for tolerant species.

14. Increases in the volume and rate of stormwater runoff from large scale impervious surfaces has the ability to destabilise stream channels and cause accelerated stream channel erosion (and associated downstream sedimentation). Detaining water and releasing it slowly assists in reducing accelerated stream channel erosion downstream, but it will not reduce the

[1] Ira S. 2021. Freshwater management tool: report 10. A total economic valuation approach to understanding costs and benefits of intervention scenarios – Part 2 Urban Source Control Costs. Prepared by Koru Environmental for Auckland Council.
[2] Auckland Regional Council. 2010. Development of the Contaminant Load Model. Auckland Regional Council Technical Report 2010/004
[3] Kelly, S 2010. Effects of stormwater on aquatic ecology in the Auckland region. Prepared by Coast and Catchment for Auckland Regional Council. Auckland Regional Council Document Type 2010/021.

volume of water which is discharged. Disconnecting the impervious surfaces from the receiving environment via green infrastructure approaches such as rain gardens or swales, together with providing for extended detention more readily mitigates stream channel erosion effects.

WATER SENSITIVE DESIGN

15. Land use and development decisions are closely connected to the health and wellbeing of water, and the risks of water related natural hazards to communities. Improving the integration of land use and water planning is essential to achieve a vision of protecting and enhancing the life supporting capacity of the Region's waters - te mana o te wai.

16. Water Sensitive Design (WSD) is an approach which is used internationally to manage these risks[4]. WSD is not a new approach to managing stormwater discharges and has been called Low Impact Design (LID) in the United States (and previously as Low Impact Urban Design and Development (LIUDD) in New Zealand), Sustainable Urban Drainage Systems (SUDS) in the United Kingdom and Europe, and Water Sensitive Urban Design (WSUD)/ WSD in Australia and more recently in New Zealand.

17. In the New Zealand context, WSD is defined as "*an approach to freshwater management, it is applied to land use planning and development at complementary scales including region, catchment, development and site. Water sensitive design seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities*"[5]. WSD aims to:

    17.1 promote interdisciplinary planning and design
    17.2 protect and enhance the values and functions of natural ecosystems
    17.3 address stormwater effects as close to source as possible
    17.4 mimic natural systems and processes for stormwater management, often via the use of green infrastructure

[4] Ira, S.J.T. 2022. Auckland Water Strategy Supplementary Document: Investigation of barriers and opportunities to further implement Water Sensitive Design in Auckland. Report prepared for Auckland Council.
[5] Lewis, M., J. James, E. Shaver, S. Blackbourn, A. Leahy, R. Seyb, R. Simcock, P. Wihongi, E. Sides, and C. Coste. 2015. Water Sensitive Design for Stormwater, Auckland Council Guideline Document GD2015/004. Auckland Council, Auckland, New Zealand, p.193

18. A WSD approach to land development therefore uses a myriad of stormwater interventions, from minimising earthworks on a site, to enhancing stream values, to avoiding the generation of contaminants by using inert materials (source control), and finally to mitigating the effects of stormwater discharges through structural controls applied across the site. Additionally, a 'treatment train' approach (an approach to stormwater management which uses a series of source control and treatment solutions to avoid or mitigate stormwater effects) is integral to WSD to reduce effects from the quality and volume of water discharged to a receiving system.

19. The philosophy of WSD is very clearly aligned with the protection of values under the NPSFM, the requirement for the integrated management of land use and development effects on freshwater ecosystems under the NPSFM, and the need to avoid, remedy or mitigate effects of development on the receiving environment, as required under the RMA.

20. The Bay of Plenty Regional Council's stormwater guideline document (herein after referred to as the BOPRC stormwater design guideline)[6] state that "LID should be incorporated into all site development plans to reduce potential impacts on receiving systems" (Chapter 7, page 87). As mentioned in paragraph 16, LID stands for 'Low Impact Design' and is another internationally used term for 'Water Sensitive Design' or 'green infrastructure'.

EFFICACY OF THE STRUCTURE PLAN'S PROPOSED APPROACH TO AVOID, REMEDY OR MITIGATE WATER QUALITY AND STREAM EROSION EFFECTS

21. Plan Change 93 proposes the use of a series of stormwater treatment and detention ponds to mitigate stormwater effects on the Oturu Creek. The approach uses 2 water quality treatment and extended detention ponds on either side of a main attenuation pond, which is on-line of the existing stream, to provide peak flow control back to 80% of the pre-development peak flow in a 1% Annual Exceedance Probability (AEP) event.

22. The original Plan Change 93 scheme plan and assessment did not incorporate either Water Sensitive Design (WSD) or green infrastructure practices into the proposed stormwater management approach.

[6] Bay of Plenty Regional Council. 2012 (updated 2015). Stormwater Management Guidelines for the Bay of Plenty region. Guideline prepared by Earl Shaver, Aqua Terra International Ltd.

23. In his evidence, Mr Raynor is now no longer precluding the use of additional stormwater management measures, including:

- The use of on-site stormwater rain gardens and similar systems for water quality treatment;
- Stormwater retention tanks in parking/roading areas for stormwater attenuation;
- The use of inert roofing.

24. From a water quality treatment perspective, this approach more closely aligns with the principles of WSD or LID. It avoids contamination where possible by recommending the use of inert roofing materials and provides for at source treatment via the use of rain gardens and/ or swales. These devices have the added benefit that they are able to 'disconnect' impervious areas from the receiving environment and provide for some degree of reduction in accelerated stream channel erosion, in combination with the extended detention provided by the ponds.

25. Pre-hearing discussions with the applicant, as well as Mr Raynor's evidence, confirms that stormwater treatment and extended detention will be provided by 2 constructed wetlands, not ponds. I am supportive of this approach and was originally concerned with the proposed use of ponds.

26. Stormwater ponds are not considered to be best practice stormwater management devices for providing treatment for metals and reducing temperature effects. Auckland Council's contaminant load model (CLM – v2, 2010[7]) estimates that a wet pond only removes approximately 30% and 40% of total zinc from roads and other paved surfaces respectively. Additionally, ponds only remove around 5% of zinc from roofing materials. This is because the majority of zinc from roofs is dissolved. Ponds remove stormwater contaminants via the process of sedimentation (i.e. the zinc would need to be in particulate form to be removed in the pond) and therefore they are very inefficient at removing dissolved contaminants. As a point of comparison, wetlands remove 70% of zinc from roads and other paved surfaces. The vegetative processes

[7] Auckland Regional Council. 2010. Development of the Contaminant Load Model. Auckland Regional Council Technical Report 2010/004

operating within wetlands are responsible for this higher level of contaminant removal and their ability to remove dissolved contaminants.

27. It is for this reason that Section 9.5.13 of the BOPRC stormwater design guideline states (page 161):

"While this Guideline is a 'toolbox' of available stormwater management practices, constructed wetlands are preferred to open water ponds because they provide better filtration of contaminants, including dissolved ones due to densities of wetland plants, incorporation of contaminants in soils, adsorption, plant uptake, and biological microbial decomposition (more in depth discussion in Section 9.5.7). In addition, wetlands, being shallow water bodies do not have the safety issues associated with deeper water ponds. For these reasons, the BOPRC has a preference for shallow wetland ponds where ponds are used."

28. For the reasons provided earlier in my evidence, I fully support this statement.

29. Wetlands have many added benefits over ponds:

24.1 Designed correctly, wetlands will not result in temperature spikes on the receiving freshwater streams, as opposed to ponds which can cause temperature effects, as I described earlier.

24.2 The dense vegetative planting surrounding the wetland is an added safety feature and acts as a deterrent for any children or adults wanting to swim in the ponds.

24.3 The dense vegetation surrounding the wetlands helps to reduce the resuspension of contaminants during higher flow events. This is especially important for the structure plan site as the proposed stormwater treatment ponds will be inundated in larger storm events >5 year Average Recurrence Interval (ARI).

30. I am therefore supportive of the applicant's amended proposal (as stipulated in Mr Raynor's evidence) to use wetlands, in addition to the source control and at-source solutions described in paragraph 23. This type of would more adequately manage the effects of contaminants discharged to the Oturu Creek than the original stormwater treatment proposal. However, the applicant has not demonstrated that their stormwater treatment approach is feasible and will not lead to a loss of natural values based on the currently proposed commercial zone layout (as discussed by Ms Thiel-Lardon and Mr Hamill).

31. In this regard, the applicant has not demonstrated that an integrated approach for stormwater quality and quantity can be achieved on this site, and has not undertaken a robust analysis of alternatives. Additionally, the proposal wouldn't fully meet the philosophy of WSD and give effect to the NPSFM.

32. A key premise of a WSD approach is to protect and enhance natural ecosystems. The applicant proposes a large scale, on-line stormwater attenuation pond which will lead to effects within the stream system and loss of the raupo wetland. These effects are discussed further in Mr Hamill's evidence. Additionally, a feasibility study has not been undertaken which provides Council with any degree of certainty that there is sufficient space to safely construct the stormwater management system within the green space allocated between the proposed commercial zones. Ms Thiel-Lardon addresses this issue in her evidence, along with the need for appropriate stormwater modelling to be undertaken to accurately assess the relevant large storm event attenuation needs for this site.

33. Not only are these aspects of the proposal contrary to the basic philosophy of WSD (internationally considered as the best practice approach for stormwater management), the currently proposed on-line attenuation pond is inconsistent with the BOPRC stormwater design guidelines. Page 161 of the BOPRC stormwater design guideline states:

"BOPRC has preference for 'off-line' placement of ponds rather than 'on-line'. Off-line ponds are considered to be those ponds not physically located in perennial watercourses. They can be in gullies or upland areas. On-line ponds are located on streams having perennial flows and their impact to the stream itself can be significant. On-line ponds alter geomorphic and biological character of streams and these alterations may adversely impact on the streams natural character and function."

34. The lack of integration between land use planning and stormwater management, as demonstrated in this structure plan, compromises the health and wellbeing of water, and increases the risks of water related natural hazards to communities. A robust options analysis has not been undertaken, and viable alternatives, through the use of a holistic WSD approach, not considered. It is therefore considered that the best practical option for the integrated management of stormwater has not been undertaken.

RESPONSE TO THE PLANNER'S REPORT

35. I disagree with the Planner's report and assessment for the management of water quality effects from the proposed rezoning. The applicant's original Section 32 evaluation did not demonstrate that the stormwater management approach would achieve the purpose of the RMA, nor the NPSFM. Additionally, reasonably practical options for achieving these objectives, with respect to stormwater treatment, were not discussed or assessed at the time the Planner's report was written.

36. Topic 3 (Structure Plan Map) of the Planner's report states that the applicant revised their proposed Structure Plan Map (Option 3, Figure 4) in response to, amongst other things, flood conveyance and stormwater management concerns. I note that whilst Figure 4 does show a higher level of protection for the southwestern and southern tributaries, the stormwater treatment approach in Figure 4 is unchanged from the original Structure Plan Map. For the reasons provided earlier in my evidence, I disagree with the Section 32AA analysis that the Structure Plan Map shown in Figure 4 will have benefits associated with stormwater mitigation and protection to improve downstream effects. Effects on the stream system itself, resulting from the construction and operation of the on-line attenuation pond, have not been considered. Furthermore, I reiterate that structure plan-wide constructed stormwater wetlands, as part of a treatment train approach, would provide for a higher level of treatment, is safer and has reduced effects from temperature and potential resuspension of contaminants in larger flood flows.

37. With respect to Topic 8, Stormwater, I strongly disagree that a 'conservative approach' to stormwater management was incorporated into the Plan Change and Structure Plan, as described in the Planner's report. I do not consider that Option 2 in the Planner's report addressed any of the stormwater treatment concerns raised by the BOPRC submission.

38. In order to meet the intent of the RMA and to give effect to the NPSFM provisions for integrated management of land use and development effects on freshwater receiving systems (s.3.5.1(c)) and the protection of values, the Structure Plan needs to consider an integrated approach for stormwater management which is directed at avoiding or mitigating effects of water quality and quantity through

source control, at source management and structure plan wide treatment/ detention. A WSD approach to land development, as set out in my evidence, would achieve this.

39. Effects from stormwater discharges are often only assessed as significant when considered cumulatively. Small contributions of contaminants or gradual increases in flow through development may not be noticeable on a day-to-day basis. However, over time and as development within a catchment increases, these small increases in flow or contaminants collectively combine to give a noticeable and significant effect[8]. The need to consider effects collectively necessitates a catchment or sub-catchment based approach. These types of approaches are usually considered at the structure planning stage and implemented via provisions within a district plan. The resource consent process is prescriptively narrow and considering catchment-wide cumulative effects from stormwater discharges is challenging at best.

40. Resultantly, Section 3.5 of the NPSFM directs local authorities to adopt an integrated approach, as required by te mana o te wai, to manage the effects of land use on the receiving environment. Amongst other things, Section 3.5.1 (c) of the NPSFM requires that local authorities:

> "*manage freshwater, and land use and development, in catchments in an integrated and sustainable way to avoid, remedy, or mitigate adverse effects, including cumulative effects, on the health and well-being of water bodies, freshwater ecosystems, and receiving environments;"*

41. The current WBOPDC District Plan does not give effect to this section of the NPSFM and does not include sufficient controls to manage the effects of water quality discharges on the receiving environment. Whilst Policy 12.2.2 (5) requires subdivision and development to comply with minimum standards which result in improved environmental outcomes, no clarity is provided on what level of improvement may be needed for various types of land uses or receiving environments, and cumulative effects are not considered.

42. A robust analysis of alternative methods of avoiding, remedying or mitigating effects of stormwater discharges has not been undertaken for this plan change and I therefore consider that the best practical option for the integrated

[8] Bay of Plenty Regional Council. 2005. Development of Comprehensive Stormwater Consent Applications and Catchment Management Plans. Guideline Number: 2005/02

management of stormwater effects from the proposed Commercial zone has not been undertaken.

RESPONSE TO APPLICANT'S EVIDENCE

43. I have read and considered the evidence submitted on behalf of the applicant by Mr Neill Raynor and Mr Aaron Collier with respect to water quality and integrated stormwater management.

44. Mr Raynor states that his stormwater engineering assessment for the plan change did not take account of on-site options and source control but that there is no reason why these measures (outlined in paragraph 23 of my evidence) could not be considered through the resource consent process.

45. Additionally, Mr Raynor's evidence states that the treatment ponds discussed in the application documents will be off-line treatment wetlands (paragraph 6.3 of Mr Raynor's evidence).

46. Whilst my evidence clearly demonstrates that I am supportive of these approaches for managing effects of water quality, I disagree that the overall stormwater management approach should be refined and decided at the consenting stage.

47. For the reasons explained in paragraphs 39 to 42 the current WBOPDC District Plan does not give effect to the requirement for integrated management under the NPSFM and does not include sufficient controls to manage the effects of water quality discharges on the receiving environment.

48. I also disagree with Mr Raynor's response to the BPORC Submission (No. 17), as outlined in paragraph 8.1 of his submission. The submission does not require the provision of "sizing and design of stormwater infrastructure". Rather the submission sought provisions to ensure a low level of risk, which would consider among other things "detailed design of stormwater mitigation measures to ensure overland flow paths upstream are managed". In my opinion a robust assessment of alternative forms of stormwater management options is needed to ensure the best practical option is selected. As outlined by Ms Thiel-Lardon, the proposed approach is potentially not feasible when overlaid with the new commercial zones, and this has flow on consequences for the design framework and approach for the stormwater management system as a whole. This level of

feasibility analysis and assessment of alternatives should be undertaken at the structure planning stage when the effects of land use decisions on the receiving environment can be considered.

49. Mr Te Pairi has responded in detail to the statement of evidence provided by Mr Collier. One additional point which I would like to raise is that I disagree with Mr Collier's assessment that sufficient provisions exist to manage the effects of water quality discharges on the receiving environment within the District Plan. There are no activity performance standards under rule 12.4.5 or 12.4.10 of the District Plan which recognise or provide for WSD (or low impact design) stormwater systems. Whilst rule 12.4.5 refers to Council's Development Code, the code is outdated (written in 2009), is inconsistent with best practice stormwater management and refers to sustainable "Low Impact Disposal". Low Impact Disposal does not equate to Low Impact Design or Water Sensitive Design (as described in the literature and the BOPRC stormwater design guideline) and should not be relied upon to adequately avoid or mitigate cumulative effects from stormwater discharges. Rule 12.4.10 does not include adequate provisions for the integrated management of stormwater effects, protection of receiving environment values nor adequately accounts for source control, on-site stormwater management solutions or WSD.

RECOMMENDATIONS AND OUTCOMES SOUGHT

50. In order to meet the intent of the RMA and give effect to the NPSFM, the Structure Plan needs to include provisions to require an integrated stormwater management approach for avoiding, remedying or mitigating water quality and quantity effects on the receiving freshwater ecosystems.

51. This integrated approach should be based on best practice and best available stormwater information. Ms Thiel-Lardon has outlined that WBOPDC's hydrological model of the catchment is available for use to determine flow and volume control requirements.

52. Once the water quantity mitigation requirements have been determined via the catchment-wide model, these can be integrated with the water quality treatment requirements (as set out in my evidence) and a holistic approach for stormwater management for the structure plan area developed. Stormwater planning is an iterative process, and is closely linked to land use planning, and therefore it is

likely that a range of alternatives (which include measures such as impervious surface limits, protecting natural areas, reworking zoning extents to reduce earthwork volumes, various treatment train approaches), would need to be assessed before the best practicable option (BPO) for stormwater management is selected.

53. The vision for this 'BPO' would then need to be set via clear structure plan provisions which provide a certainty of outcome for the local authority, developers, regional council, iwi and the community. The potential to avoid eroding the outcomes sought during the structure plan process are substantially reduced when the necessary provisions to protect receiving environmental values are included within the amended District Plan provisions.

54. Whilst I support the treatment train approach for managing water quality effects from the Commercial zone which the Applicant has offered through this hearing, I am unable to support the plan change until such time as the Applicant has demonstrated that the BPO, as described above, for a fully integrated approach to managing the effects of urban development on the receiving streams has been selected and is supported by clear outcomes focussed provisions within the District Plan.

DATE 1 July 2022

SUSAN IRA