BEFORE THE IHP

TOPIC: Proposed Plan Change 92 Enabling housing supply to the Western Bay of Plenty District Plan

UNDER	the Resource Management Act 1991
IN THE MATTER	of submissions and futher submissions
BETWEEN	**BAY OF PLENTY REGIONAL COUNCIL**
	Submitter
A N D	**WESTERN BAY OF PLENTY REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE OF SUSAN IRA

DATED: 18 August 2023

Topic: Water Quality, Water Sensitive Design and Integrated Stormwater Management

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STATEMENT OF EVIDENCE OF SUSAN JEAN TYSON IRA

Qualifications, experience and background

1. My full name is Susan Jean Tyson Ira. 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.

2. 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.

3. I have specialist expertise in water quality treatment approaches, catchment management planning, 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 and providing ongoing expert advice on scenario modelling, optimisation and implementation.

4.4 Undertaking an independent review of rain garden implementation across the Auckland region on behalf of Auckland Council.

4.5 Providing water quality advice, technical consent application and compliance reviews to Greater Wellington Regional Council on the stormwater management approach and stream diversions for Transmission Gully since 2014.

4. I became involved with Proposed Plan Change 92 to the Western Bay District Plan in 2022 when Koru Environmental Consultants Ltd was engaged to undertake a review of the proposed stormwater provisions. I have also been involved in the development of the Ōmokoroa Stage 3 catchment management plan since November 2021. During this time I have acted as a consultant on behalf of the Bay of Plenty Regional Council (BOPRC) to provide advice and expertise to Western Bay of Plenty District Council (WBOPDC) on the scope of the CMP and providing them with feedback on a draft version of the CMP. I am also currently contracted to BOPRC to assist with a water quality technical review of WBOPDC's current Ōmokoroa Comprehensive Discharge Consent Application.

5. I attended a pre-hearing meeting with WBOPDC and the BOPRC on 24th of January 2023.

6. My expert opinion covers the BOPRC submission points related to my subject area. I will briefly address matters that have been agreed in general approach with WBOPDC as set out in the s.42A Report (which has the status of evidence) and where an agreed approach has not been possible I set out more fully the reasons for my expert opinion.

7. Where I have not expressly stated in this evidence the reasons why I disagree with other experts or submitters in relation to more minor matters, that should not be interpreted as agreement.

8. I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023 and I agree to comply with it. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where I state I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my expressed opinion.

9. My evidence should be considered together with the evidence of **Mr Nathan Te Pairi**, **Ms Anna McKay, Ms Marlene Bosch, Mr Mark Ivamy, Mr Mark Townsend** and **Mr Keith Hamill.**

Scope of evidence/summary

10. My evidence covers the need for integrated stormwater management at the land use planning stages and water quality effects of land use change on the freshwater and marine receiving environment. My evidence is given in support of the BOPRC submission and pertains to the stormwater treatment approach recommended to mitigate water quality effects from areas which would be rezoned as part of the proposed PC92 structure plan. I confirm that I have read all the relevant documentation.

11. Specifically, my evidence relates to the BOPRC's submission points 25.7, 25.10, 25.13 – 25.17, 25.19, 25,21, 25,22, 25,24, 25.19, 25.31, 25.43 – 25.45, and associated relevant further submission points.

12. The main points I wish to bring to the Panel's attention are:

    (i) Catchment planning is needed at the land use decision stage. This approach is essential because 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.

(ii) WBOPDC have prepared a catchment management plan for the Ōmokoroa Stage 3 area. I fully support the preparation of this document and the approach which it recommends for managing the effects of stormwater discharges on the receiving environment.

(iii) The Ōmokoroa Stage 3 catchment management plan (CMP) relies on a water sensitive design and treatment train approach to managing the effects of stormwater discharges. The focus of this approach is the use of natural systems (such as swales, rain gardens and wetlands) as well as the management of contaminants and stormwater at source (such as rain tanks and using inert building materials) to not just mitigate but also avoid effects from contaminants and 'disconnect' impervious areas from the receiving environment.

(iv) I consider the approach recommended in the CMP encompasses the best practicable option (BPO) for managing the effects of stormwater discharges from increases in impervious area within the Stage 3 area. However, in order to ensure this BPO is implemented, provisions need to be incorporated into PC92. I am fully supportive of proposed provision 12.4.5.17(b) recommended in the s.42A Planner's Report.

(v) The requirement for stormwater management plans, as detailed in 12.4.5.17(b), is needed to support an integrated approach to stormwater management and to ensure stormwater infrastructure designed at the subdivision stage is in general accordance with the CMP.

(vi) With respect to water quality management and implementation of Water Sensitive Design, I am fully supportive of provision 12.4.5.17(b) proposed by WBOPDC in the s.42A Planner's Report, and the recommended amendments to Chapter 14A as outlined in **Mr Te Pairi's** evidence**,** for the remainder of the medium density residential zones in Ōmokoroa and in Te Puke. The provisions advocate for water sensitive design approaches to be taken as part of a BPO approach during intensification of these areas.

Effects of development on the receiving environment

13. 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 (Figure 1). 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.

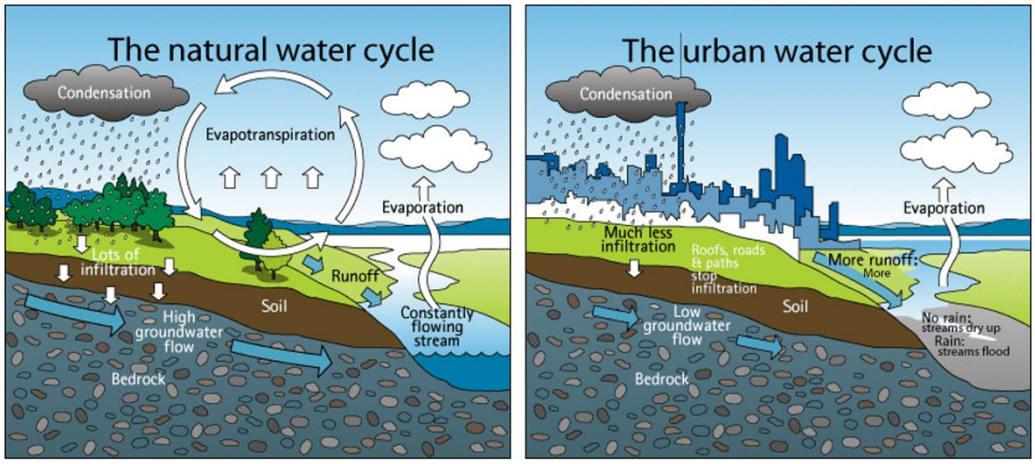

Figure 1 Changes to the natural water cycle as a result of urban development

14. This leads to three key effects from stormwater discharges, 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.

15. Urbanisation generally requires large areas of impervious surfaces, which can vary from about 50% to 90% of the site area, depending on the density and nature of the land use. Key contaminants of concern from urban areas include sediments, metals (such as zinc, copper and lead), hydrocarbons and temperature.

16. Sources of metals (Figure 2): 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

[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.

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[1]. 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.

Figure 2 Urban contaminant sources

17. 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.

18. Increases in the volume and rate of stormwater runoff from large scale impervious surfaces has the ability to destabilise stream channels and

[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.

cause accelerated stream channel erosion (and associated downstream sedimentation) (Figure 3). Detaining water and releasing it slowly assists in reducing accelerated stream channel erosion downstream, but it will not reduce the 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.

Figure 3 A stream modified by urban development, and showing signs of stream erosion and poor water quality

Ōmokoroa Stage 3 Area: Integrated Landuse Planning, Water Sensitive Design and Catchment Planning [submission points 25.10; 25.13 – 17; 25.22; 25.44]

19. Given that 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, an integrated approach to 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.

20. Conversely, a lack of integration between land use planning and stormwater management can compromise the health and wellbeing of

water, and increases the risks of water related natural hazards to communities.

21. In order to meet the intent of the RMA and to give effect to the NPSFM 2020 provisions for integrated management of land use and development effects on freshwater receiving systems (s.3.5.1(c)) and the protection of values, structure plans need to consider this integrated approach. Regularly across New Zealand, this integration is achieved through catchment planning.

22. A Catchment Management Plan (CMP) is a planning tool which investigates a full range of catchment wide effects and risks from stormwater discharges resulting from land use changes to the receiving environment and recommends options for the management of those effects.

23. Best practice considers that CMPs should be undertaken at the outset of the structure planning process and outcomes recommended through the CMP should be fully integrated into the structure plan to ensure that the cumulative effects of the land use change are appropriately managed.

24. This is achieved by range of responses including ensuring the infrastructure is appropriately planned and designed to minimise the water quality and quantity effects from urban development on the receiving environment.

25. Consequently, development should occur in a manner that is consistent with the objectives and management approaches set out in the relevant CMP.

26. WBOPDC have prepared a CMP for the Ōmokoroa Stage 3 area. As mentioned in paragraph 4, I was involved with providing advice, support and technical review of the CMP on behalf of BOPRC. I fully support the preparation of this document and the approach which it recommends for managing the effects of stormwater discharges on the receiving environment.

27. The Stage 3 CMP for Ōmokoroa sets out a number of recommendations for stormwater quality and quantity management (Sections 13 – 17 and Appendix A of the CMP), which are based on various ecological surveys,

technical studies, and hydrological modelling. It recommends a series of 'treatment train approaches' which vary based on different types of landuses.

28. The treatment trains have been based on an outcomes-focused toolbox that gives developers and WBOPDC flexibility to choose solutions that are fit for purpose as development in Stage 3 progresses. The CMP states that:

> "*It is envisaged that detailed design of stormwater systems and the approval process will ensure specific stormwater design solutions respond to the objectives of this CMP. Such an approach will provide certainty that the catchment objectives set out in Section 3 are met on an ongoing basis and account for cumulative effects of stormwater discharges from the catchment.*".

29. This 'treatment train' type of approach is analogous with a water sensitive design (WSD) approach to stormwater management and land use planning. WSD is used internationally to manage risks of stormwater discharges. It is not a new approach 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.

30. 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*". WSD aims to:

- promote interdisciplinary planning and design;
- protect and enhance the values and functions of natural ecosystems;

- address stormwater effects as close to source as possible; and
- mimic natural systems and processes for stormwater management, often via the use of green infrastructure.

31. WSD is not just about providing for water quality management. Importantly, through the use of green infrastructure it 'disconnects' impervious areas from the receiving environment and assists with reducing the volume and rate at which stormwater is discharged to the receiving environment, therefore reducing accelerated stream channel erosion. WSD also provides water quality benefits via practices such as clustering, soil amelioration, reducing impervious surfaces and green infrastructure, which can lead to a reduction in potential flooding. The approach effectively aims to mimic the natural water cycle (Figure 1).

32. A WSD approach to land development uses a wide range of holistic 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 catchment and site.

33. The 'treatment train' approach (an approach to stormwater management which uses a series of source control and treatment solutions to avoid or mitigate stormwater effects – Figure 4), as recommended in the Ōmokoroa Stage 3 CMP, is therefore integral to WSD.

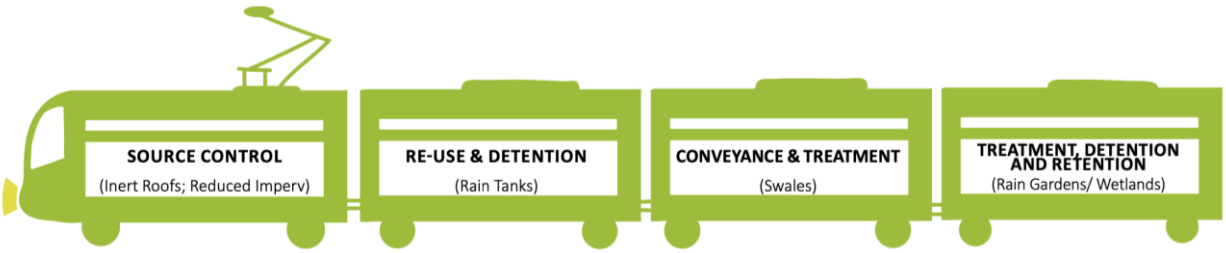

Figure 4 An example of a treatment train approach

34. 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.

35. The Bay of Plenty Regional Council's stormwater guideline document states that "*LID should be incorporated into all site development plans to reduce potential impacts on receiving systems*" (Chapter 7, page 87)[4]. As mentioned previously, LID stands for 'Low Impact Design' and is another internationally used term for WSD or 'green infrastructure'.

36. I consider that the objectives of the CMP and the approach recommended through Appendix A and Sections 13 – 17 of the CMP are consistent with a WSD approach and encompass the best practicable option for managing the effects of stormwater discharges from increases in impervious area within the Stage 3 area.

37. WBOPDC's s.42A Planner's Report recommends revised wording for Objective 12.2.1.6 and Policy 12.2.2.7. I am supportive of these changes as they acknowledge that subdivision and development needs to minimise water quality effects on the receiving environment, and references consideration of WSD and the objectives, methods and options of the relevant CMP.

38. The Planner's Report also recommends a change to rule 12.4.5.17 to ensure that subdivision and development is designed in accordance with the relevant CMPs. In my opinion, the redrafted 12.4.5.17(b)(I – IV) requires that effects of stormwater discharges from future subdivision and development within the plan change area would be managed according to best practice, i.e. through a WSD approach. Additionally, it is noted that:

    (i) The proposed wording of 12.4.5.17(b) closely mirrors the key stormwater quality management objectives of the Ōmokoroa Stage 3 CMP, i.e. to

        - incorporate the water sensitive design principles and options to implement the treatment train concepts;

        - recommend options to manage the effects of construction, maintenance and operation of any option on the receiving environment; and

[4] Bay of Plenty Regional Council. 2012 (updated 2015). Stormwater Management Guidelines for the Bay of Plenty Region. TR 2012/01

- prioritise options for stormwater systems which that avoid the loss of extent and value of natural wetlands, rivers, water bodies and the receiving environment by modification or discharges.

(ii) The requirement for stormwater management plans (SMPs), as detailed in 12.4.5.17(b) is needed in order to support an integrated approach to stormwater management and to ensure stormwater infrastructure designed at the subdivision stage is in general accordance with the CMP.

(iii) SMPs are the key method recommended by BOPRC to ensure that the CMP objectives are met, whilst still allowing the developers flexibility through the detailed design process.

(iv) As explained in the Planner's Report for Section 12, the Ōmokoroa Peninsula comprehensive stormwater consent (CSC) (ref. 61768) has expired and WBOPDC have applied for a new CSC. It is noted that the expired consent advocates for a WSD (low impact design) approach where practical (condition 6.5).

39. I am also fully supportive of the application of 12.4.5.17(b) for the balance of the Ōmokoroa Peninsula and for Te Puke. WSD can be applied on a single site scale or a catchment-wide scale, and in brownfields or greenfields development areas. By using inert roofing materials, rain tanks and green infrastructure through redevelopment, effects of stormwater discharges from intensification on the receiving environment, communities and the capacity of WBOPDC's stormwater network can be reduced. The Te Puke CSC does currently advocate for a WSD (low impact design) approach where practical (condition 6.5) and 12.5.4.17, as recommended through the s.42A Report, now provides clarity and consistency as to how WSD can be applied in this catchment. In my opinion this will assist in achieving the planned outcomes of the CSC, and is a positive improvement.

Stormwater treatment approaches – some considerations

<u>Efficacy of ponds versus stormwater wetlands to mitigate water quality effects [submission point 25.24 and 25.7]</u>

40. Plan Change 92 proposes the use of a series of stormwater treatment and detention ponds to mitigate stormwater effects from the plan change area.

41. From a water quality treatment perspective, wetlands more closely align with the principles of WSD or LID. Wetlands are able to provide all the necessary water quantity peak flow reduction and extended detention functions as a pond can (see Appendix A), but with a greater level of water quality treatment and less effect on the receiving environment.

42. 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[5]) 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 operating within wetlands are responsible for this higher level of contaminant removal and their ability to remove dissolved contaminants.

43. It is for this reason that Section 9.5.13 of the BOPRC stormwater design guideline[6] 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."*

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

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

45. Wetlands have many added benefits over ponds:

    (i) 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.

    (ii) 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.

    (iii) The dense vegetation surrounding the wetlands helps to reduce the resuspension of contaminants during higher flow events.

    (iv) Wetlands are shallower systems than stormwater ponds, with the majority of the wetland depth being 0.1 – 1m depth (see Appendix A), making them safer than deeper ponds.

46. For the reasons provided above, I am supportive of the referencing of wetlands in the Ōmokoroa Structure Plan Three Water Infrastructure Map and Infrastructure Schedule.

<u>Deciduous trees and stormwater management [submission point 25.19]</u>

47. Deciduous trees, such as maple trees, can increase the cost burden on Council and ratepayers due to increased blockages caused by autumn leaf falls.

48. The notified version of PC92 promoted the use of deciduous trees in the Ōmokoroa Stage 3 town centre, and their implications on the stormwater management system were not considered. Leaf fall can significantly increase the difficulty and cost of maintaining stormwater infrastructure such as catchpits, swales and rain gardens, and can cause blockages at inlets which can lead to localised flooding and complaints.

49. The Planner's report (Section 12, Topic 14, Rules 12.4.11.2) has confirmed that native trees will be used in the town centre and that works along Ōmokoroa Road are predominantly complete. For the reasons provided in paragraphs 47 and 48 of my evidence, I am supportive of the use of native trees in the town centre.

Medium Density Residential (Ōmokoroa and Te Puke) [submission points 25.24; 25.27; 25.31; 25.43 – 25.45]

50. 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.

51. The proposed changes to the Ōmokoroa and Te Puke medium density residential areas will allow for significant additional infill, allowing up to 70% imperviousness for Ōmokoroa and 50% for Te Puke on a lot/ site basis.

52. 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[6]. 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.

53. As stated in paragraphs 29 - 35 of my evidence, WSD is an internationally accepted approach which is offered as a way of managing risks and cumulative effects of stormwater discharges.

54. Resultantly, I am fully supportive of the application of provision 12.4.5.17(b) for the Te Puke plan change area and the balance area in Ōmokoroa. WSD can be applied on a single site scale or a catchment-wide scale. By using inert roofing materials, rain tanks and green

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

infrastructure through redevelopment, cumulative effects of stormwater discharges from intensification on the receiving environment and on the capacity of WBOPDC's stormwater network can be reduced. For these reasons I am also supportive of the proposed amendments to Chapter 14A, as recommended by **Mr Te Pairi** in his evidence.

55. Appendix B provides further support and comments on the application of WSD in Te Puke via the Te Puke Stormwater Management Guidelines and the Residential Design Outcomes document.

<u>The definition of net site area:</u>

56. As discussed in paragraph 52, small contributions of impervious areas may not lead to noticeable day-to-day effects from stormwater discharges, but over time they can collectively combine to give a noticeable and significant effect.

57. The definition proposed in PC92 for 'net site area' excludes driveway areas. Since Ōmokoroa and Te Puke are now planned to become medium density areas, there is greater potential for stormwater runoff from impervious surfaces. For these infill areas, driveways can form a significant part of the impervious area on a site, especially when accessing rear sites. Impervious surface 'creep' from infill developments leads to cumulative effects on the stormwater network and can compromise existing levels of service if not mitigated.

58. The impervious surface limit of 70% in Ōmokoroa and 50% in the Te Puke Stormwater Management Area are determined according to the guidance provided by Rule 14A.4.2(d) which, as notified, was based on an applicant determining their impervious area based on the 'net site area', which excludes legal accessways within a site. This approach is strongly opposed and would lead to unmitigated incremental increases in impervious areas leading to long term cumulative effects.

59. This issue has been addressed in the s.42A Planner's Report and I am fully supportive of WBOPDC's recommended approach defining the impervious surface limits for rule 14.4.2(d) on the basis of '*site*' rather than '*net site area'*. I am also fully supportive of the comprehensive definition of 'impervious area' which is used in PC92. I query if the word "area" which

is still shown in the collated version of the amended provisions[7] should be removed too, so that it reads “site” and not “site area”, which is an undefined term.

Response to the planners report

60. For the reasons provided throughout my evidence (paragraphs 13 – 59), I am fully supportive of the recommended provisions in the Planner’s Report relating to water quality management, WSD and the provision of SMPs. The provisions underpin a management approach which, in my opinion, integrate the management of water quality and quantity effects at the land use planning stage, as well as providing a framework which would adequately avoid, remedy or minimise cumulative and long term water quality effects from greenfield and infill urban development. Additionally, they require the consideration of WSD, internationally accepted as best practice for the management of effects from stormwater discharges. Finally, the requirement to submit SMPs as part of the consent process will provide surety for WBOPDC, BOPRC and the community that the management approaches provided for in the relevant CMPs will be implemented.

61. I am supportive of the slight amendments to the provisions in Chapters 12 and 14A recommended by **Mr Te Pairi** to avoid, remedy or mitigate effects of stormwater discharges from PC92.

Response to the submitters

62. As discussed in paragraph 37 of my evidence, the Planner’s Report recommends revised wording for Objective 12.2.1.6 and Policy 12.2.2.7. The Retirement Villages Association (FS 76.22) and Ryman Healthcare (FS 7722) oppose the additional policy wording on the basis that it does not provide for the benefits of retirement villages or recognise their functional or operation needs.

63. Retirement villages can often lead to large areas of impervious surfaces being constructed. These impervious surfaces have the potential to generate and convey contaminants, as would be the case with other

[7] Section 42A report – Attachment B – Recommended Changes to District Plan p262/403 electronic file; p18/38 page number of section.

housing, road or business areas. From a contaminant generation perspective, there is no technical reason why retirement villages should be excluded. On this basis, I support the WBOPDC Planner's assessment.

64. I am supportive of these changes as they acknowledge that subdivision and development needs to minimise water quality effects on the receiving environment, and references consideration of WSD and the objectives, methods and options of the relevant catchment management plan.

65. Topic 11 of the Planner's report provides a detailed discussion on the submissions received in support and opposition to Rule 12.4.5.17. With respect to Rule 12.4.5.17(b), Kāinga Ora (29.13) request deletion of references to WSD on the basis that such detail is likely to be included in the relevant CMPs. Whilst rule 12.4.5.17 has been rewritten, it does still reference WSD. Based on the information I have presented in my evidence, I oppose Kāinga Ora's submission point and am supportive of the redrafting of rule 12.4.5.17 as provided in the s.42A report.

Closing

66. Overall I consider that the provisions proposed within the s.42A Planner's Report are needed to support an integrated approach to stormwater management and provide a transparent, consistent and effective framework for the management of water quality effects from urban development on the receiving environment, and are therefore appropriate.

67. In this regard, I am supportive of the Stage 3 CMP for Ōmokoroa and consider that the approach recommended in the CMP is reflected in the proposed provisions.

68. I am fully supportive of proposed provision 12.4.5.17(b) recommended in the s.42A Planner's Report and the associated amendments to Chapters 12 and 14A recommended by BOPRC's planner, **Mr Te Pairi**.

Dated 18 August 2023

Susan Ira

APPENDIX A

Constructed Stormwater Ponds and Wetlands:
BOPRC SW Guidance – Design and sizing for water quality and detention

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


BOPRC SW Guidance – Design and sizing for water quality and detention
Constructed Stormwater Ponds and Wetlands

Stormwater Ponds

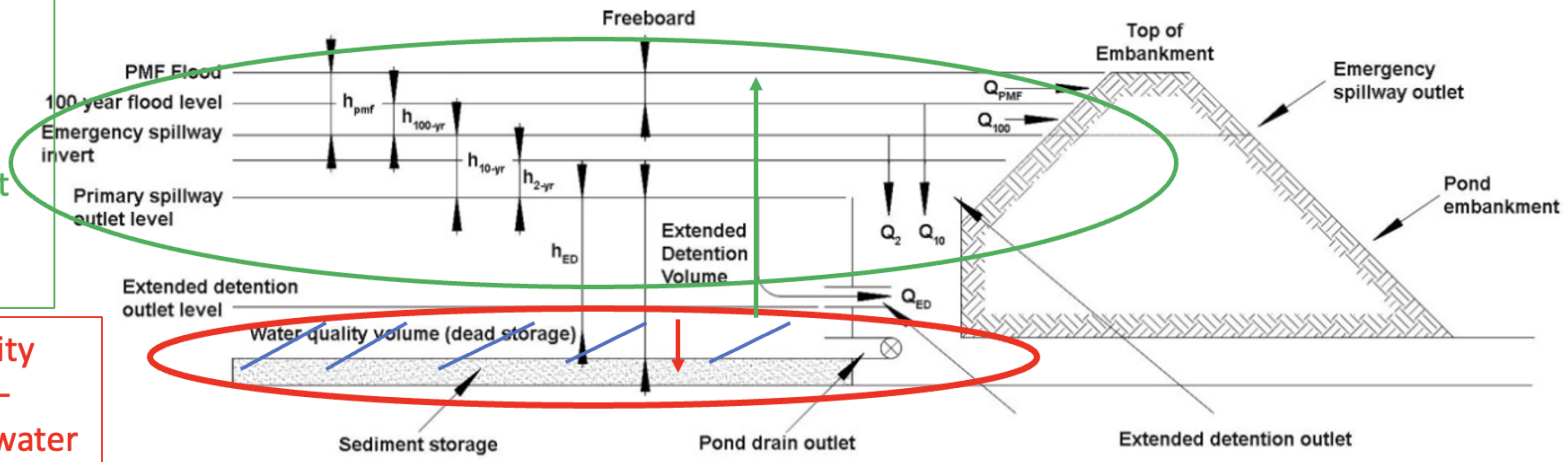
Difference is below the water level
Case studies – changes between the two

Design for water quality - based on the water quality volume

Extended detention and peak flow control above the permanent water level of the pond.

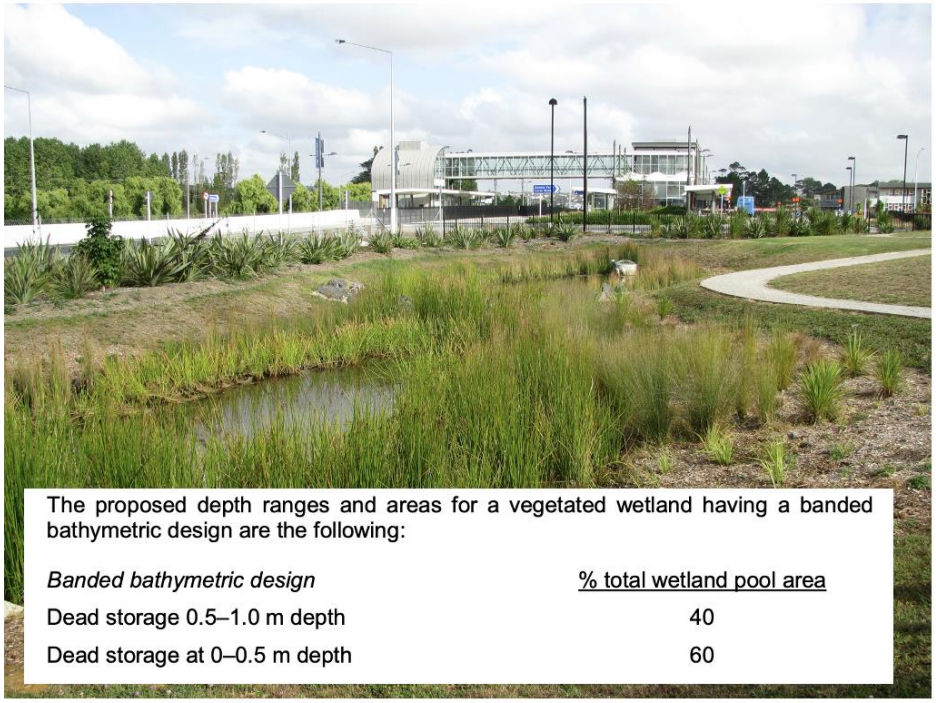
Water quality treatment – volume of water below the permanent water level.

Figure 9.21 - Schematic of pond outlet components



Constructed Stormwater Wetlands

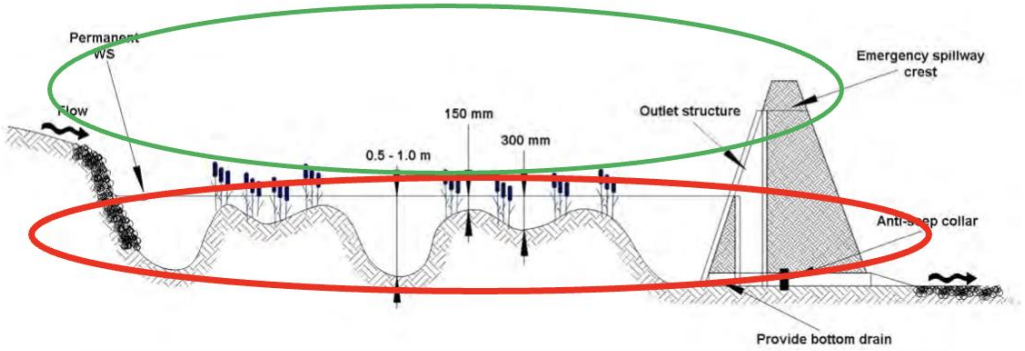
Design for water quality – based on 2% wetland surface area of the contributing catchment area.



The proposed depth ranges and areas for a vegetated wetland having a banded bathymetric design are the following:

Banded bathymetric design	% total wetland pool area
Dead storage 0.5–1.0 m depth	40
Dead storage at 0–0.5 m depth	60

Extended detention and peak flow control above the permanent water level of the wetland – sizing requirements identical to pond.



Water quality treatment – below wetland surface area (2%)

Constructed Stormwater Wetland – Design steps (page 179)

The design steps are the following:

1. Calculate the wetland surface area as at least 2% of the contributing catchment area.
2. The shape of the wetland should generally be that its length should be at three times its width. These criteria can be relaxed if extended detention were required as flows will be significantly reduced and the length to width ratio is not as important.
3. Using the depth discussion above ensure that the percentage of wetland depths meet the above criteria with a banded bathymetric design being preferred.
4. Calculate the water quality volume that the wetland would have in an identical approach to the wet pond water quality volume. Take 15% of that volume as the necessary volume of an emergency spillway. The surface area determined from this approach can reduce the wetland surface area, as the two areas together will meet the 2% criteria.
5. Determine whether the project needs peak flow control, stream channel erosion control or extended detention for nutrient removal through extended detention.
6. Do calculations identical to the wet pond design for extended detention release sizing and outlet sizing for the two and ten-year storms.

Wetlands vs Ponds; Online vs offline (Pg 161)

Preferences

Preferences for wetlands versus ponds

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.

On-line versus off-line

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.

However, while off-line ponds are a preference, it is not a hard and fast rule. On-line ponds will be considered on a case-by-case basis to determine suitability.

APPENDIX B

Implementation of WSD in Te Puke – Stormwayer Management Guidelines and Residential Design Outcomes

The proposed Te Puke Stormwater Management Guidelines (Appendix 4 Report 15), whilst their intent is supported, are very brief and will not adequately provide guidance to developers on the selection, design and implementation of water sensitive design options which can be used at the site scale. I note that the document erroneously refers to "impermeable paving" in one of the bullet points and this should be changed to: "~~*im*~~*permeable pavement will also be encouraged"*.

Implementation of water sensitive design, as required through the proposed PC92 provisions, would be hugely enhanced if WBOPDC updated the Residential Design Outcomes document (Appendix 8) to include guidance on water sensitive design, prepared a WSD guideline document, or encouraged design in accordance with BOPRC Stormwater Management Guidelines[6] as an interim approach.

With respect to the Sneddon Street Structure Plan area, which is outside the Te Puke Comprehensive Stormwater Consent (ref: 67481) area, PC92 could include an advice note which refers the user to the BOPRC Stormwater Management Guidelines (2012, updated 2015).