BEFORE THE CANTERBURY REGIONAL COUNCIL

UNDER THE	Resource Management Act 1991
AND	
IN THE MATTER	of application CRC190445 by the Christchurch City Council for a comprehensive resource consent to discharge stormwater from within the Christchurch City area and Banks Peninsula settlements on or into land, into water and into coastal environments

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EVIDENCE SUMMARY

ERIC ROLAND VAN NIEUWKERK FOR CHRISTCHURCH CITY COUNCIL

5 November 2018

TABLED AT HEARING

Application: CRC190445

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Date: 7 November 2018

CHRISTCHURCH CITY COUNCIL
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INTRODUCTION

1. My name is Eric Roland Van Nieuwkerk. I here summarise key points of my evidence, highlighting areas of agreement and disagreement between my opinion and that expressed by or on behalf of submitters and in the s42A report.

2. The focus of my evidence is on how the stormwater contaminant load that enters urban streams and waterways in Christchurch is expected to change in the future as a result of ongoing urban development and the further implementation of stormwater treatment systems and source control measures.

Key Matters

3. Most of Christchurch's stormwater runoff will enter urban streams and any dissolved or suspended contaminants in this stormwater has the potential to affect stream water quality. A reduction of the contaminant load in stormwater runoff can be achieved by source control options and stormwater treatment.

4. I understand Council is committed to an overall improvement of the water quality of urban streams. Council proposes targets to reduce the stormwater contaminant load as specified in Table 1. Note that the numbers listed for the 25 year case in Table 1 are derived from a linear interpolation between the 10 and 35 year case.

5. The assessment of the current stormwater contaminant loads that enter urban streams in Christchurch's four main river catchments is based on the C-CLM, which was developed from the Auckland Regional Council (ARC) Microsoft Excel Contaminant Load Model, Version 2.0 (2010).

Table 1: Reductions in stormwater contaminant load.

	Contaminant load compared to no treatment as at 2018	5 years from 2018 compared to no treatment (as at 2023)	10 years from 2018 compared to no treatment (as at 2028)	25 years from 2018 compared to no treatment (as at 2043)	35 years from 2018 compared to no treatment (as at 2053)
TSS	12 %	21 %	25 %	27 %	29 %
Total Zinc	10 %	15 %	18 %	20 %	21 %
Total Copper	16 %	23 %	28 %	30 %	31 %

6. C-CLM has been used to estimate annual stormwater contaminant loads, by multiplying the land use type surface area with the contaminant load rate per land use type, and summarising this per stormwater sub-catchment. Land use type groups considered include grass lands, roofs, roads and paved areas, which are further divided into a total of 18 land use categories, with contaminant load rates (or 'contaminant yields') for total suspended solids (TSS), total zinc and total copper specified. A total of 89 stormwater sub-catchments across the four main river catchments (Styx, Avon, Heathcote and Halswell) were identified, for which the annual contaminant loads were assessed.

7. The C-CLM includes load reduction factors (i.e., treatment efficiencies) for treatment facilities used in a catchment. The load reduction factors are applied to individual source areas (e.g., roads, roofs) within a treatment catchment in the model allowing multiple treatment methods to be applied throughout a given sub-catchment.

8. The C-CLM was used to model a 'Best Practice Infrastructure' (BPI) scenario and various source control and treatment scenarios that would result in a relative reduction of catchment-wide contaminant loads in the next 35 years. The BPI scenario represents the current situation (base case) and expected future

stormwater treatment systems developments, which are currently planned for the next 35 years. The BPI forms the basis of this consent application.

9. The BPI scenario entails the implementation of best practice stormwater treatment measures in 'greenfield' developments (i.e., grassland being developed into new residential or business areas). This scenario also includes a gradual implementation of practical measures for improvement of stormwater management within existing urban areas (e.g., planned upgrades of the road corridor, council reserves and parks, brownfield developments). Under this scenario the fraction of city's catchment area that would be subject to stormwater treatment would increase from approximately 15 % currently to 38 % over a period of 35 years.

10. Urban development (greenfield development, renewal and densification) but foremost the full implementation of currently planned treatment systems in the next 35 years in the BPI scenario is expected to reduce the contaminant load in stormwater by 20 – 30 %.

11. The results from the BPI scenario are compared to the following source control and treatment C-CLM scenarios:

    11.1. Street Sweeping

    11.2. Routine Roof Replacement

    11.3. Iron Roof Painting

    11.4. Copper Brake Pad Removal

    11.5. Increased Treatment

12. **Street sweeping:** NIWA (2011) concluded that the city-wide sediment removal effect of street sweeping is 10 % to 30 %. I have not encountered information to assess the city-wide sediment removal effect of street sweeping for Christchurch. I have undertaken an indicative assessment of the benefits of street sweeping with the C-CLM assuming 20 % sediment removal effect from sweeping. I found that the relative benefits of street sweeping will gradually decline as treatment systems become operational and provide for the removal of contaminants. It would appear

to me that improving street sweeping practices further will have limited beneficial effect on the reduction of contaminant loads entering streams when ever-more treatment systems are implemented.

13. **Routine roof replacement and iron roof painting:** Individual property owners will choose to change the roofs over time. This routine replacement of roofs by individual property owners is expected to have a relatively small benefit to reducing the contaminant load (11 % reduction). If property owners are encouraged to paint or repaint their unpainted or poorly-painted iron roofs (or if the roof would be replaced with a pre-painted steel, or tile roof), the benefits for reducing the zinc load to stream would be considerably more (24 % reduction).

14. **Copper brake pad removal:** Copper brake pad removal has been estimated to lead to about 94 % reduction in copper load in next 35 years if implemented nationally.

15. **Increased treatment:** The catchment-wide load post-treatment (i.e. to stream) reduces if the stormwater from a larger area of the city is treated. The total area in which stormwater is treated, would have to increase significantly from that included in the BPI scenario to achieve a notable further contaminant load reduction. Treatment systems can be combined so that stormwater will pass multiple treatment systems to achieve a higher contaminant removal rate. Introducing combined treatment systems, instead of expanding the total area treated, appears to be considerably less efficient than expanding the total area treated.

16. I consider the C-CLM provides sufficient information to infer the likely future trends in the stormwater contaminant load and the contaminant load reduction benefits of source control and treatment measures. However, the available stormwater contaminant field investigation data from Christchurch that I have encountered is limited and the C-CLM results are only indicative for the relative changes in the future contaminant loads. The implementation of source control and treatment measures could involve considerable costs and I support the Application's proposal to improve the understanding of stormwater contaminant processes in Christchurch, to ensure source control and treatment measures are cost-effective and appropriate. I also support the proposal for further research to improve the

understanding of stormwater contaminant loads, transport and effective mitigation processes for Christchurch.

17. In addition, I support the proposals for ongoing monitoring and mitigation aimed at identifying 'problem areas' where high contaminant loads enter the urban streams and provide for a targeted mitigation approach.

Areas of agreement and disagreement with s42A report

18. Ms Stevenson for ECan notes the following key concerns in relation to the C-CLM:

    18.1. Reduction targets listed in Table 1 above, have no relationship to the Receiving Environment Objectives and Attribute Target Levels.

    18.2. Contaminant load rates are dependent on topographic conditions, soil types and local climate conditions. These factors are very different in Christchurch compared to Auckland. Therefore, Auckland CLM contaminant load rates are inappropriate to use in the C-CLM to predict stormwater contaminant loads.

    18.3. Idealistic treatment efficiencies have been used in the C-CLM and mitigated contaminant loads are presented as best-case scenarios. The C-CLM results for the future cases are therefore unrealistic.

19. I acknowledge the reduction targets listed in Table 1 above, have no relationship to the Receiving Environment Objectives and Attribute Target Levels. I note the relationship between stormwater contaminant load and the instream water quality is complex and more research is required to better understand this relationship. I also note the C-CLM only predicts annual mass loadings of contaminants and therefore it cannot be used to assess the instream water quality in terms of absolute concentration. The purpose of the model is to predict relative changes in long term average improvement in stormwater quality due to land-use changes, source control and employment of stormwater treatment systems.

20. I agree that Auckland conditions are very different from those in Christchurch. However, I conclude that using Auckland contaminant load rates in the C-CLM

result in an over-estimation of contaminant loads to streams. Furthermore, the purpose of the C-CLM is to assess relative changes, hence the absolute accuracy of the model's contaminant load results has little relevance, as long as the contaminant load rates reflect the main sources noted in paragraph 61 of my evidence in chief.

21. I consider the assertions about the treatment efficiencies are not supported by reported studies or practical experience and should be discounted. I agree with Mr Kennedy that the treatment efficiencies used in the C-CLM are appropriate to present a realistic expectation of the level of stormwater treatment that can be achieved in the next 35 years. However, I acknowledge that substandard design, construction and maintenance of treatment systems are likely to affect the long-term water quality outcome. The treatment efficiencies I have assumed for the C-CLM are what can be realistically achieved with well-maintained and appropriately designed systems. Therefore, I consider regular performance reviews of installed treatment devices and reassessment of the catchment-wide stormwater quality outcomes appropriate.

Areas of agreement and disagreement with submissions

22. Mr Cameron, who provides evidence on behalf of NZ Steel, raises the following key concerns in relation to the C-CLM:

    22.1. Concerns about the accuracy of the Contaminant Load Model (CLM) used to predict current and future contaminant loads and the associated reliance on the ability of the model to measure progress against specific load reduction targets.

    22.2. There does not appear to be a clear link between the relative proportions of different sources of contaminants and the management response proposed by the Council, which could include restrictions on the use of certain building products. There are many sources of zinc in the environment, and many existing sources of zinc are not proposed for control or management in the CSNDC application.

22.3. There is a generally decreasing load of zinc to urban waterways as a result of replacement of older painted and unpainted galvanised steel (i.e. iron). This change is being driven by market forces rather than any restriction on building materials.

23. Mr Cameron does not specify the basis of his concerns about the C-CLM's accuracy. I acknowledge there are opportunities to improve the accuracy of the C-CLM. However, I consider the C-CLM is fit for the intended purpose as stated above. In addition, Mr Cameron refers to Dr Brett Ogilvie's evidence on the same CLM model approach as has been used in the C-CLM. I therefore do not consider that Mr Cameron's concerns regarding the C-CLM's accuracy are based on any relevant factual evidence.

24. The purpose of the C-CLM is to assess contaminant contribution of urban function (such as buildings and roads) and not of other potential sources as discussed by Mr Cameron. Nonetheless, I consider the total area of roofs and roads exposed to the elements in Christchurch exceeds the total area of other exposed external structures (such as stairwells and fences) that may contribute to the total zinc load, and these are addressed in the C-CLM assessments. Mr Cameron's assertion that there appears to be no clear link between the relative proportions of different sources of contaminants and the management response proposed in the CSNDC application, is therefore incorrect in my opinion.

25. I agree that routine replacement of older poorly-painted or unpainted iron roofs would lead to a reduction in the total zinc load to urban waterways. I therefore consider source control options to be effective measures in reducing the stormwater contaminant load. However, routine roof replacement is relatively slow, and it takes many decades for the benefits gained from this to materialise. Furthermore, I consider that the purpose of any stormwater treatment and source control efforts are defeated if building materials continue to be allowed to leach considerable amounts of contaminants over time. In my opinion, market forces are typically not driven by environmental gains, and I disagree with the suggestion that these are better placed to deliver an improvement of stormwater quality than restrictions of building materials.

ERIC ROLAND VAN NIEUWKERK

5 November 2018