BEFORE THE INDEPENDENT HEARING PANEL APPOINTED BY WAIKATO REGIONAL COUNCIL

IN THE MATTER	of the Resource Management Act 1991 (the Act)
AND	
IN THE MATTER	Submissions made on Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments

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PRIMARY STATEMENT OF EVIDENCE OF GILLIAN MARGARET HOLMES FOR HORTICULTURE NEW ZEALAND (WATER QUALITY)

3 May 2019

CONTENTS

SUMMARY AND CONCLUSIONS

1. This evidence provides a technical assessment of the impact of providing for limited increases in commercial vegetable production (CVP) above that currently occurring across the catchment while achieving the objectives of PC1. This is referred to as new or increased CVP throughout my evidence.

2. Currently, I believe PC1 does not provide adequate provisions for new CVP given the clear change in position from "managing and reducing" contaminants to the direction around reduction and no increases for any and all contaminants. This change of position is shown in the s42A Officers' Report for PC1, through the amendments to Policies 1, 2 and 6 and particularly in the section related to Land Use Change.

3. I believe when considering the potential effects of a new activity it is important to remember the core values of PC1 and how they relate to water quality, and what water quality attributes relate to which values. While all four contaminants identified as important in PC1 relate to set core values, some contaminants, such as *E. coli*, can be used as a direct measure for multiple core values. I believe this needs to be taken into consideration when considering the potential effects of new CVP.

4. In the investigations undertaken by Jacobs (2017 and 2018), it has been shown that new CVP will result in a minimal increase in N, while also providing considerable improvements in other contaminants, such as *E. coli*. In some catchments where *E. coli* is the major contaminant, these improvements will go towards meeting the core values of PC1.

5. In some subcatchments, i.e. Mangaonua and Mangakotukutuku, *E. coli* is the biggest issue. Therefore, it follows that these subcatchments may benefit from CVP being undertaken instead of other production activities.

6. Land use change to CVP (beyond the current land area utilised for this activity) is currently proposed to be restricted under Rule 3.11.5.7, with HortNZ making submissions on Policy 6 to try and ensure that applications for land use change to commercial vegetable production (increase beyond the notification date land use area) can be assessed on a net basis across all four contaminants.

7. The s42A Report discussed these suggestions (in paragraph 498) and consequently rejected them on the basis that *at a catchment scale* "an increase in any contaminant cannot be justified".

8. I disagree with these findings as it should be acknowledged that, although new CVP will result in an increase in N on a

property scale, this increase is negligible when taken into consideration with total N loads in a subcatchment (i.e. the cumulative effect on the subcatchment).

9. Technical work was undertaken in 2018 and presented in Jacobs (2018) to support this statement. Scenario modelling was undertaken to show the negligible effect on attenuated N, P, *E. coli* and sediment loads when CVP was expanded within the Waikato Region.

INTRODUCTION

Qualifications and experience

10. My full name is Gillian Margaret Holmes

11. I am employed by Jacobs New Zealand Ltd (Jacobs), an engineering and environmental consulting firm. I am contracted to provide water quality expertise on the Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments (PC1) to Horticulture New Zealand (HortNZ).

12. I hold a Bachelor of Science (BSc) in Geography (2001) and a Master of Science Degree in Physical Geography (2004) from Otago University.

13. I have 14 years' experience in the field of hydrogeology and water resources. I started my career at MWH New Zealand Limited and worked for them between 2004 and 2007 and joined Sinclair Knight Merz (now Jacobs) in 2007.

14. I have previously acted as an Expert Witness in groundwater related consent hearings in New Zealand. In addition, I have recently submitted expert evidence on the Proposed Water Conservation Order for the Ngaruroro River and Clive River on behalf of HortNZ.

15. I regularly provide expertise in the fields of hydrogeology and groundwater quality to a range of local government clients including Bay of Plenty Regional Council and other organisations such as HortNZ, Wairakei Pastoral Limited and the New Zealand Transport Agency.

16. I am familiar with Plan Change processes through providing technical support for expert witnesses for Variation 6 of the Waikato Regional Plan, as well as supporting the expert witnesses for HortNZ on Hawkes Bay Regional Council's Tukituki River Catchment Plan Change 6. This support for Variation 6 of the Waikato Regional Plan has provided me with knowledge of the Waikato River catchment surface water flows and groundwater.

Code of Conduct

17. While this is not a hearing before the Environment Court, I can confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses produced by the Environment Court and have prepared my evidence in accordance with those rules. My qualifications as an expert are set out above.

18. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

19. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Background and Role

20. I have been asked to prepare evidence based on my (and my colleagues) research, assessment and reporting for HortNZ in support of their key submission points on PC1.

21. HortNZ is concerned that PC1 does not give enough consideration to the fact that horticulture farming systems and operations are unique from other farming sectors. Due to this uniqueness, HortNZ believe that horticulture requires an additional separate consenting pathway to ensure the continued provision of vegetables to domestic communities. I understand that commercial vegetable production will be addressed in more detail in Block 3. My evidence is therefore, provided as context to what you will hear further.

22. Two reports were completed to support HortNZ's key submission points, namely:

    (a) Jacobs (2017). Healthy River Plan Change Technical Support for Horticulture New Zealand's Submission, Values and Current Allocation of Responsibility for Contaminant Discharges.

    (b) Jacobs (2018). Healthy Rivers Plan Change – Technical Support for Horticulture New Zealand, Additional Technical Report for Further Submission.

23. I did not contribute to the Jacobs (2017) report, however I was the main reviewer for the second technical report (2018). As both reports are interlinked, I have detailed knowledge of all the technical work completed by Jacobs and outlined in both technical reports.

24. I attended the Proposed Plan Change 1 – Waikato and Waipa Catchments Information Forum on 21 November 2018 as an expert for HortNZ.

25. In addition, I have attended the first two days of Expert Conferencing on Table 3.11-1 and will attend the third day scheduled for 15 May 2019. As this conferencing is ongoing,

no matters related to Table 3.11-1 will be covered in my Block 2 Hearing evidence.

Purpose and Scope of Evidence

26. This evidence provides a technical assessment of those provisions within the scope of Block 2 hearings on which HortNZ submitted and addresses the Section 42A Report for Block 2 prepared by WRC.

27. More specifically this evidence provides a technical assessment of the impact of providing for limited increases in CVP land use over and above that currently occurring across the catchment. This is referred to as new CVP throughout my evidence while achieving the objectives of PC1.

INCREASES IN COMMERICAL VEGETABLE PRODUCTION LAND AND ACHIEVING THE OBJECTIVES OF PC1

28. The technical reports completed by Jacobs (2017 and 2018) as well as the Block 1 evidence of Lucy Deverall (paragraphs 51 – 56) outlines the importance of LUC 1 and 2 land for CVP. The evidence of Michelle Sands also outlines the need for additional LUC 1 and 2 land within the Waikato catchment to support the future requirement for domestic fruit and vegetable production in the Waikato.

29. An overview of the PC1 subcatchments, area of LUC 1 and 2 land, and percentage available for new CVP is provided in Appendix A of my evidence. This information outlines that there are many catchments in the Waikato and Waipa catchments that have LUC 1 and 2 land currently not utilised for CVP, which could be utilised in the future if the planning framework allowed, or if the land is deemed suitable for CVP dependent on if the land is designated for urban development or water access. In addition, this information highlights that not all catchments would support the addition of CVP.

30. Currently, I believe PC1 does not provide adequate provisions for new CVP or increased CVP given the clear change in position from “managing and reducing” contaminants to the direction around reduction and no increases for any and all contaminants. This change of position is shown in the s42A Officers’ Report for PC1, through the amendments to Policies 1, 2 and 6 and particularly in the section related to Land Use Change.

31. I believe when considering the potential effects of a new activity it is important to remember the core values of PC1 and how they relate to water quality, and what water quality attributes relate to which values. These core values were discussed in detail in Jacobs (2017 and 2018) and have been summarised below.

(a) Human Health for Recreation – measured against concentrations of *E. coli* (in lakes, rivers and lake-fed rivers), chlorophyll a (lakes and lake-fed rivers), and levels of clarity (lakes, rivers and lake-fed rivers) (Note the key contributors to visual clarity are considered to be yellow substance, phytoplankton and fine sediment).

(b) Ecosystem Health – measured against trophic state indicators such as concentrations of chlorophyll a (lakes and lake-fed rivers) and planktonic cyanobacteria (lakes only), TP and TN concentrations (lakes and lake-fed rivers), and nitrate-N and ammoniacal N (as toxicants in rivers and lake-fed rivers).

(c) Mahinga kai – measured against concentration of *E. coli* (in lakes, rivers, and lake-fed rivers) and chlorophyll a (lakes and lake-fed rivers) and planktonic cyanobacteria (lakes only).

32. This assessment indicates that while all 4 contaminants identified as important in PC1 relate to set core values, some contaminants, such as *E. coli*, can be used as a direct measure for multiple core values. I believe this needs to be taken into consideration when considering the potential effects of new CVP.

33. In the investigations undertaken by Jacobs (2017 and 2018), it has been shown that new CVP production will result in a minimal increase in N, while also providing considerable improvements in other contaminants, such as *E. coli*. In some catchments where *E. coli* is the major contaminant, these improvements will go towards meeting the core values of PC1.

34. In some subcatchments, i.e. Mangaonua, *E. coli* is the biggest issue. Therefore, it follows that in this subcatchment water quality may benefit from CVP being undertaken instead of other production activities. Specific information on the Mangaonua subcatchment was provided in Section 2 of Jacobs (2018) and is outlined below.

(a) Mangaonua subcatchment has an area of 8,096 ha and the corresponding percentage land uses are 1% horticulture, 32% dairy, 41% sheep and beef, and 2% urban.

(b) 56% of the catchment is classified as LUC 1 and 2 land which would be favourable for CVP, with 1% (90.34 ha) currently utilised for CVP.

(c) Baseline TN concentration for this subcatchment is lower than many of the other subcatchments, however the median *E. coli* concentration is much higher than all other 74 subcatchments in the Waikato region (and

the 95th percentile *E. coli* is the third highest out of all subcatchments). TN is not the main water quality issue in the subcatchment and the subcatchment may benefit from a decrease in *E. coli* into the river network.

(d) A reduction in *E. coli* will directly benefit towards the progression of two of the three core values within PC1. Therefore, horticulture should be able to expand into other subcatchments and those subcatchment may benefit with an increase in horticulture and decrease in either dairy or sheep and beef. This improvement would currently not be able to be undertaken under Rule 3.11.5.5 of PC1.

35. Similarly, the Mangakotukutuku Stream subcatchment has the highest baseline 95th percentile *E. coli* concentrations (12,600 *E. coli*/100ml) and the highest baseline TP concentration (0.415 mg/m^3). The baseline TN concentration is lower than many of the other subcatchments. As such, *E. coli* and TP are the main water quality issues within this subcatchment. Specific information on the Mangakotukutuku catchments is provided below.

(a) Mangakotukutuku subcatchment has an area of 2,708 ha and the corresponding percentage land uses are 0.04% horticulture, 43% dairy, 21% sheep and beef, and 19% urban.

(b) 64% of the catchment is classified as LUC 1 and 2 land which would be favourable for CVP, with only 0.04% (1 ha) currently utilised for CVP.

(c) CVP currently undertakes mitigation strategies to minimise the loss of phosphorus to waterways. A reduction in *E. coli* and TP will directly benefit towards the progression of all three core values within PC1. Therefore, horticulture should be able to expand into other subcatchments and those subcatchment may benefit with an increase in horticulture and decrease in either dairy or sheep and beef.

36. As outlined in Mr Keenan's evidence (paragraph 32), land use change to CVP (beyond the current land area utilised for this activity) is currently proposed to be restricted under Rule 3.11.5.7, with HortNZ making submissions on Policy 6 to try and ensure that applications for land use change to commercial vegetable production (increase beyond the notification date land use area) can be assessed on a net basis across all four contaminants.

37. The s42A Report discussed these suggestions (in paragraph 498) and consequently rejected them on the basis that *at a catchment scale* "an increase in any contaminant cannot be justified".

38. I disagree with these findings as it should be acknowledged that, although new CVP will result in an increase in N on a property scale, this increase is negligible when taken into consideration with total N loads in a subcatchment (i.e. the cumulative effect on the subcatchment).

39. The area of CVP properties should also be taken into consideration. In general, CVP properties are much smaller than pastoral farms. Most CVP farms would make a small proportion of the total area of an average pastoral farm in the region. Larger dairy farms have the ability to average land uses of varying intensity within the farm over the property scale (e.g. they have the ability to offset at a farm scale). This is not possible on CVP properties due to the smaller areas utilised. As such I believe that providing assessment of CVP effects at the sub-catchment scale, is consistent with the flexibility provided for offset on large pastoral enterprises.

40. Technical work was undertaken in 2018 and presented in Jacobs (2018) to support this statement. Scenario modelling was undertaken to show the negligible effect on attenuated N, P, *E. coli* and sediment loads when CVP was expanded within the Waikato Region.

41. Three scenarios were modelled using the NIWA modelling information as follows:

    (a) Scenario 1 – 5% horticultural mitigation (assuming a 5% reduction in horticultural N losses due to mitigation strategies);

    (b) Scenario 2 – 10% horticultural mitigation (assuming a 10% reduction in horticultural N losses due to mitigation strategies); and

    (c) Scenario 3 – 10% growth in horticultural area (assuming a 5% reduction in horticultural N losses due to mitigation strategies, along with a 10% growth in horticultural area into dairy and dairy support land uses).

42. The scenarios were tested on all 74 subcatchments within PC1 with the results shown in Table 1. It can be seen that through the implementation of Scenario 3, the total attenuated N load across the Waikato increases slightly by 3 t N/yr (0.02%). In addition, the attenuated P load increases by 0.2 t P/yr (0.02%) and sediment loss increases by 1.76%. There is also a slight reduction in *E. coli* of 0.07%. It should be noted that while sediment load was modelled in the Jacobs (2018) report, it

was unmitigated, and therefore has not been presented in this evidence[1].

43. I consider these increases to be negligible, particularly when this analysis did not take into account any reduction of dairy properties where leaching rates are greater than the 75th percentile. Previous work outlined in Jacobs (2017) has shown that the reduction by the dairy sector to comply with N leaching level at the 75th percentile to be the equivalent of the whole nitrogen load for the horticultural section (397 t N/yr).

Table 1 : Scenario results totalled for all 74 subcatchments.[2]

	N attenuated load (t N/yr) [% change from baseline]	**P attenuated load (t P/yr) [% change from baseline]**	***E. coli* attenuated load (10^{15} organisms/yr) [% change from baseline]**
Baseline	12,541	972.7	80.41
Scenario 1	12,519 [-0.17%]	972.7	80.41
Scenario 2	12,502 [-0.31%]	972.7	80.41
Scenario 3	12,544 [0.02%]	972.9 [0.02%]	80.35 [-0.07%]

44. In terms of specific subcatchment effects, the results for the Mangaonua catchment have been investigated, for consistency with the earlier analysis in my evidence. The total current horticultural area in Mangaonua is 1% or 90.34 ha, when this is increased by 10%, the total horticultural area would be 99.37 ha.

45. The increase in horticultural area in the Mangaonua subcatchment will result in the following contaminant load changes outlined below in Table 2.

46. Once again, the overall changes in subcatchment loads are negligible and do not support the findings of the s42A Report around concerns of increased contaminants on a catchment scale through the expansion of CVP. It should be noted that sediment load could not be modelled for the Mangaonua catchment given the simplification of sediment modelling

[1] However, the evidence of Mr Andrew Barber demonstrates that with appropriate mitigations, CVP can adequately manage sediment loads to have minimal impact on water quality.

[2] While this table has been taken from Jacobs (2018), the numbers have changed following the review by NIWA in February 2019. The report Jacobs (2018) will be updated and reissued prior to Hearing Block 2.

across the catchments (as outlined in Jacobs (2018, Section 3).

Table 2 : Predicted change in N, P and E. coli load under a 10% growth in Scenario 3.

Contaminant load	Supplied Attenuated Baseline Load	Calculated Attenuated Load after 5% mitigation and 10% horticulture growth	Overall Change in Subcatchment Load
Attenuated N load (t/year)	80.14	80.17	0.04%
Attenuated P load (t/year)	6.243	6.246	0.04%
Attenuated E. coli load (10^{15} organisms/year)	0.903	0.902	-0.11%

Gillian Holmes for Horticulture New Zealand
3 May 2019

APPENDIX A – LUC 1 AND 2 LAND IN PC1 SUBCATCHMENTS

Catchment Name	Total Catchment Area (ha)	Land Use Capability Area (ha)		% LUC 1 and 2 Available for New CVP
		LUC 1	LUC 2	
Awaroa (Rotowaro) at Harris/Te Ohaki Br	4,724	0	406	8.6%
Awaroa (Rotowaro) at Sansons Br	4,561	0	0	0.0%
Awaroa (Waiuku)	2,506	6	509	19.7%
Firewood	3,372	0	14	0.4%
Kaniwhaniwha	10,259	0	1,322	12.8%
Karapiro	6,741	53	451	7.0%
Kawaunui	2,134	0	0	0.0%
Kirikiriroa	1,233	0	862	69.5%
Komakorau	16,399	1,076	13,696	90.0%
Little Waipa	10,649	302	114	3.9%
Mangaharakeke	5,415	0	0	0.0%
Mangakara	2,235	0	0	0.0%

Mangakino	22,186	0	0	0.0%
Mangakotukutuku	2,708	78	1,658	64.1%
Mangamingi	5,175	0	0	0.0%
Mangaohoi	431	0	0	0.0%
Mangaokewa	17,419	0	18	0.1%
Mangaone	6,760	4,048	2,094	89.3%
Mangaonua	8,096	1,531	3,001	54.9%
Managpiko	28,069	0	11,959	42.6%
Mangapu	16,170	0	945	5.8%
Mangarama	5,528	0	1	0.0%
Mangarapa	5,443	0	111	2.0%
Mangatangi	19,452	0	3,415	17.6%
Mangatawhiri	6,808	0	268	3.9%
Mangatutu	12,269	0	816	6.2%
Mangauika	978	0	0	0.0%
Mangawara	35,884	0	17,890	49.6%
Mangawhero	5,347	396	3,998	81.4%
Matahuru	10,629	0	2,306	21.7%

Moakurarua	20,630	0	1	0.0%
Ohaeroa	2,033	0	663	27.5%
Ohote	4,041	189	2,017	54.4%
Opuatia	7,067	0	253	3.0%
Otamakokore	4,573	0	0	0.0%
Pokaiwhenua	32,701	0	157	0.5%
Pueto	20,029	0	0	0.0%
Puniu at Bartons Corner Rd Br	22,785	0	4,044	17.3%
Puniu at Wharepapa	16,853	0	0	0.0%
Tahunaatara	20,816	0	0	0.0%
Torepatutahi	21,721	0	0	0.0%
Waerenga	1,959	0	71	3.6%
Waikere	10,426	0	1,989	19.1%
Waikato at Bridge St Br	4,987	1,626	1,899	66.9%
Waikato at Horotiu Br	5,294	280	1,903	41.2%
Waikato at Huntly-Tainui Br	17,048	997	7,098	47.1%
Waikato at Karapiro	53,969	2,452	3,353	10.4%
Waikato at Mercer Br	44,583	693	7,634	17.7%

Waikato at Narrows	12,878	3,081	6,029	69.9%
Waikato at Ohaaki	29,009	0	0	0.0%
Waikato at Ohakuri	53,139	0	0	0.0%
Waikato at Port Waikato	26,110	678	3,785	14.6%
Waikato at Rangiriri	6,453	0	1,319	20.4%
Waikato at Tuakau Br	14,980	235	2,770	17.2%
Waikato at Waipapa	69,392	0	0	0.0%
Waikato at Whakamaru	44,667	0	0	0.0%
Waiotapu at Campbell	6,079	0	0	0.0%
Waiotapu at Homestead	20,478	0	0	0.0%
Waipa at Mangaokewa Rd	3,221	0	0	0.0%
Waipa at Otewa	28,665	0	284	1.0%
Waipa at Otorohanga	13,889	0	3,231	23.2%
Waipa at Pirongia-Ngutunui Rd Br	43,607	0	11,412	26.1%
Waipa at SH23 Br Whatawhata	31,506	2,051	12,200	44.9%
Waipa at Wainaro Rd Br	15,484	730	4,064	30.3%
Waipapa	10,047	0	0	0.0%
Waitawhiriwhiri	2,222	0	1,057	47.6%

Waitomo at SH31 Otorohanga	4,393	0	287	6.5%
Waitomo at Tumutumu Rd	4,318	0	0	0.0%
Whakapipi	4,648	423	1,920	43.8%
Whakauru	5,302	0	0	0.0%
Whangamarino at Island Block Rd	14,365	0	2,914	20.2%
Whangamarino at Jefferies Rd Br	9,701	0	3,129	32.0%
Whangape	31,767	0	2,215	7.0%
Whirinaki	1,080	0	0	0.0%