BEFORE THE HEARING COMMISSIONERS
AT HAMILTON

IN THE MATTER	of the Resource Management Act 1991 ("**the Act**")
AND	
IN THE MATTER	of the hearing of submissions on The Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments: Block 3

STATEMENT OF EVIDENCE BY CHRISTOPHER KEENAN FOR HORTICULTURE NEW ZEALAND

9 JULY 2019

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SUMMARY STATEMENT

1. This evidence addresses the Horticulture New Zealand ("**HortNZ**") submission, further submissions and the Waikato Regional Council's ("**WRC**") Section 42A Report responses to the submissions on the Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments ("**PC1**").

2. I am of the view that the approach provided for within the Section 42A report for Block 3 does not adequately provide for commercial vegetable production (CVP) activities; either existing activities or new activities. The Plan has been significantly altered from the notified version and the tailored approach to CVP activities no longer support the activity as envisaged.

3. In this evidence I have outlined the problems with the proposed approach; both for existing CVP operations and any potential new activity. I have considered varying options proposed by WRC and described the state of work in relation to PC1.

4. Having considered the proposed approach, I have outlined a different approach that I think would provide regulatory certainty for the sector and the Council. In determining this approach; I have sought to provide for limits to any opportunity for new CVP that ensure discharges are reduced in line with the Objectives of PC1.

5. I have also suggested some alternatives to the approach of using OVERSEER or a nutrient surplus approach, focussing on establishment of a series of proxy farm systems. A default is also proposed to stand until these proxies can be developed.

6. I have advised against deletion of the non-statutory methods within the plan and Policy 7 (Future Allocation). In my view the deletion of these does not encourage the community into transition to achieve the Vision and Strategy for the Waikato River.

7. I have also objected to the Officers preferred approach of leaving a subcatchment planning option out of the plan. In respect to a subcatchment planning approach I still support the approach proposed in the original submissions by HortNZ.

8. I have provided some new information regarding discharges from kiwifruit production and some thoughts about how the definitions for fruit and vegetable production could work in the plan.

QUALIFICATIONS AND EXPERIENCE

9. My full name is Christopher Martin Keenan. I have the qualifications and experience set out in my Statements of Evidence for Blocks 1 and 2.

10. I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

11. This evidence provides a policy overview of the proposal for regulating commercial vegetable production. I have described the approach of WRC and then described alternatives prepared by the HortNZ representatives. I have indicated in my evidence where relevant material regarding the proposed approach is to be found in other evidence briefs.

12. I have also covered other matters of concern that are discussed in Block 3 beyond the Commercial Vegetable Production rule suite. In particular I have focussed on deletion of methods and Policy 7; and the decision not to provide a regulatory pathway for Subcatchment collaboration.

13. I have also covered fruit production to a certain extent in this evidence.

WORK COMPLETED BY HORTNZ ON THE COMMERCIAL VEGETABLE GROWING PROVISIONS SINCE WORKSHOPS AND PRESENTATIONS IN HEARING BLOCK 1

14. HortNZ has continued to pursue an alternative set of provisions in line with the Council suggestions. Recently HortNZ has held discussions with growers, Plant and Food Research scientists, key technical consultants and policy staff. It is clear from these discussions that a useful method can be established to ensure grower performance against good farming practice can be established, but not in my view with the policy and rule structure proposed in the Block 3 section 42A report.

15. At the heart of our discussions is identification of a practical way to meet the requirement to benchmark current discharges and to provide Council with evidence of good practice adoption and continuous improvement overall in the discharge footprint. We have also been working to establish a pathway to consent new

commercial vegetable production to meet domestic food supply demands over the life of the plan.

16. HortNZ has been finalising evidence in chief for Block 3, I understand HortNZ seeks to meet with Council Officers between now and hearings in September for Block 3, to discuss our proposed approach.

UNDERSTANDING OF THE SECTION42A REPORT RESPONSE TO THE COMMERCIAL VEGETABLE PRODUCTION POLICY AND RULE FRAMEWORK

17. The Section 42A report for Hearings Block 3 provides some significant challenges for the horticulture sector. There has also been recognition of some difficulties that have changed both the policy and the rule structure. But the changes have reduced flexibility; and increased the difficulty and cost of consenting existing commercial vegetable production.

18. Growers have indicated that the proposed policy and rule structure is unworkable for many existing cropping operations and, in my view, it makes new commercial vegetable production impossible to obtain consent for.

19. I have therefore explained the problems with the proposed policy and rules prior to illustrating the proposed solution, so it is clear to Commissioners where the problems lie that must be addressed.

20. I have broken the following problem analysis into two sections: one dealing with problems for existing operations; and one dealing with problems that apply to the establishment of new vegetable production.

PROBLEM ANALYSIS: EXISTING CVP OPERATIONS

21. The key changes to Policy 3 are:

    (a) A requirement to apply for consent in each subcatchment a grower is operating within (New Policy 3h).

    (b) Reduction of the benchmarking period for CVP to 5 years (New Policy 3c).

    (c) Deletion of the nitrogen reference point requirement. This is replaced with a requirement to calculate nitrogen and phosphorus surpluses for each crop planted; and a requirement to establish a baseline for sediment control measures (New Policy 3c).

(d) A requirement to reduce all four contaminants (including microbial losses) within each property compared to the baselines calculated for each property (New Policy 3d). This replaces the policy of reducing average contaminant discharge over time.

(e) A requirement to continue estimating contaminant baselines on properties no longer cropped (New Policy 3h)ii).

(f) The scope of the enterprise concept within the policy has been reduced to all the properties within a subcatchment (New Policy 3h).

22. The key changes to Rule 3.11.5.5 are:

(a) Removal of the controlled activity status for existing CVP operations (New Rule 3.11.5.5).

(b) Removal of the permitted activity status until 1 January 2020. (New interim PA Rule 3.11.5.1A from the Block 2 S42A strikethrough has condition 3 excluding commercial vegetable production activities).

(c) Deletion of the "Enterprise" concept from the rule. While the rule appears to provide for one consent for multiple subcatchments (Clause 3.11.5.5 e)ii) the policy appears to disallow it.

(d) Removal of the requirement for the applicant to be part of a Certified Industry Scheme (Struck through clause 3.11.5.5.d).

(e) Inclusion of an "open ended" set of farm plan requirements that include "as a minimum" good farming practice, adherence to any minimum standards and evidence that none of the recorded benchmarks exceed the maximum annual losses in the benchmark years (3.11.5.5.h). The content of the farm plan is matter of discretion (i).

(f) Deletion of the Nitrogen Reference Point for existing commercial vegetable production activities. But it has been replaced with requirements for recorded and reported nitrogen and phosphorus surpluses and sediment control measures. [1]There is also still a requirement to calculate nitrogen reference points for any land leaving commercial vegetable production along with any procedures and

[1] There is no reference within the Section 42A report I can find that refers to how a N surplus is to be calculated so I have worked to construct a template method.

limitations that apply to the land (matter of discretion 3.11.5.5 ix).

(g) Full electronic access to all systems used to record these losses (3.11.5.5.i).

(h) A requirement to account for contaminants in a manner that demonstrates and/or monitors compliance with <u>any</u> resource consent as well as the farm environment plan (matter of discretion 3.11.5.5 vi).

23. Schedule B still requires calculation of a nitrogen reference point for any land utilised for commercial vegetable production. Given that the only nitrogen reference point referred to in Rule 3.11.5.5 applies to any land leaving commercial vegetable production, it can only be assumed that this is what the Schedule is referring to but it is very hard to make sense of.

24. Schedule B excludes from this requirement any land operating under non-complying activity Rule 3.11.5.7 or discretionary consent rule 3.11.5.6. This discretionary rule has been proposed for deletion as part of the s.42A report for Hearing Block 2.

25. New proposed Rule 3.11.5.6a does not refer to Rule 3.11.5.5 and new proposed rule 3.11.5.7 does not refer to Rule 3.11.5.5 either. Instead it refers back to new proposed Rules 3.11.5.3 (5b) and 3.11.5.4 (7). These rules apply to farming activities operating either within a CIS or outside a CIS.

26. There does not seem to be any connection between either of these rules and Rule 3.11.5.5. I am unclear how the plan works for <u>*existing operations*</u> that cannot comply with any condition of Rule 3.11.5.5. Potentially Rule 3.11.5.3 could include CVP under a Certified Industry Scheme. However existing CVP is explicitly excluded by Condition 3 of Rule 3.11.5.4. I have similar uncertainty about the pathway for new CVP and will discuss this in the next section below.

27. Proposed new Policy 3 and the proposed new Rule 3.11.5.5 exclude any increase in land area used for CVP in any subcatchment. The preference for WRC is to ensure the nutrient discharge footprint expressly relates to parcels of land[2]; and in my opinion this makes the nutrient discharge more akin to a property-based entitlement. As I noted to Commissioners in Block 1 hearings; this has the effect of stripping the entitlement from the enterprise responsible for establishing the discharge footprint in the first place. This will have a chilling effect on the ability to lease new land for commercial

[2] s42A Block 3 Para 103

vegetable production and will strongly undermine flexibility for rotation.

28. The Officers have noted there is no provision for transfer of nutrients within the plan. But growers seeking to decrease nutrient discharges may be required to find new land in new locations outside the subcatchment to produce with a lower discharge compared to current levels. There is no pathway to allow for this in the proposals.

29. Not allowing the transfer of CVP between subcatchments is a significant issue. There is very little chance that a grower will always be able to find exactly the same land area within the same subcatchment when looking for a new lease, because suitable land is so scarce. The policy approach suggested by HortNZ focussed on an enterprise operating across multiple subcatchments under a single consent. As was evident in Brendan Balle's presentation to Commissioners in Block 2; many CVP enterprises are not focussed within a single subcatchment.

30. New proposed policy 3 expressly disallows this concept, and deletion of the definition of "Enterprise" further obstructs the approach. Given that the term enterprise is still referred to in Rule 3.11.5.5 and proposed Schedule B the regulatory environment is very uncertain. I would propose that the definition be retained. If there are unintended consequences to the use of an "enterprise" concept I could agree to having the definition restricted to the interpretation of Rule 3.11.5.5. However, I consider there are wider benefits to retaining the term in full that I will discuss below in evidence relating to the implementation of catchment collectives.

31. Horticulture New Zealand has suggested a better scale for the restriction of transfer would be the FMU. This approach is unacceptable to the Officers[3]. Given the measured footprint of the sector as a whole I find it difficult to reconcile with the view of Officers that this is an unacceptable risk to achieving the Vision and Strategy. It is my understanding that Mr Hodgson and Ms Sands are proposing a new method that will quantify this risk and cap any potential effects. I will briefly outline this method in my evidence below.

REQUIREMENT TO PROVIDE NITROGEN AND PHOSPHORUS SURPLUSES

Nitrogen surplus method and alternative approaches

32. I do not believe the nitrogen surplus approach is environmentally effective or practical as a compliance tool. Initial discussions with

[3] s42A Block 3 Para 111

Plant and Food scientists indicated this may provide an alternative. However further analysis of the method has demonstrated significant obstacles. I am of the view that there are real benefits in calculating nitrogen surplus; but these benefits accrue long term and relate to the production of more accurate and up to date fertiliser recommendations.

33. Fertiliser recommendations given by fertiliser companies are almost entirely based on a book published in 1986: "*Fertiliser Recommendations for horticultural crops*"[4]. From my understanding; this venerable publication was constructed from scientific trials conducted no more recently than the 1970's. The recently produced "Nutrient Management for Vegetable Crops in New Zealand"[5] is a guideline produced by Plant and Food scientists seeking to update fertiliser recommendations.

34. I am of the view that these previous fertiliser recommendations are outdated. In my view fertiliser application rates are a critical area of research that could, if completed, result in reduced nitrogen discharges.

35. HortNZ recognised this was a research gap in 2014. I was the project manager responsible for addressing this issue at the time. HortNZ obtained funding from vegetable growers to produce the "Code of Practice for Nutrient Management"[6] adopting a risk-based approach to nutrient management in cropping with a focus on nitrogen management. But update of fertiliser recommendations was not recommended.

36. The reason why fertiliser recommendations have not been updated is quite simple:

    (a) The appropriate recommendations need to be adjusted for climate, soil type and past history of use. They are no use if not targeted to the block / area being cropped.

    (b) There are too many crops and varieties within crops to implement trials for.

    (c) The application rates adopted by growers and the yields that are consequentially realised are intellectual property for many grower enterprises. The information is not shared publicly in many instances for precisely this reason.

[4] https://www.massey.ac.nz/~flrc/shortcourses/FertHortRec.pdf

[5] http://www.processvegetables.co.nz/assets/Uploads/Nutrient-Management-for-Vegetable-Crops-in-NZ-Manual-Feb-2019.pdf

[6] http://www.hortnz.co.nz/assets/Uploads/Code-of-Practice-for-Nutrient-Management-v-1-0-29-Aug-2014.pdf

37. The most efficient way to develop more sound and up to date fertiliser recommendations is to provide a system for consistent soil testing prior to planting each crop. Then information must be reported to a centralised portal. Yield calculations and residual calculations would also need to be reported. No such data portal exists that would meet the requirements.

38. Residual calculations would also only be an estimate. In effect the residual calculation would vary with the quantity harvested each time. A table of methods would be required to calculate the residual for each crop planted in order to be consistent – no such table of methods exists.

39. I have worked through the steps proposed by Plant and Food to calculate an N surplus. I have then tried to adapt these to a regulatory framework for PC1; in coordination with the use of NZGAP as a method to collect the required information. The results of my analysis are attached as **Appendix A**. In my view the method is not suitable as a regulatory tool for the following reasons:

    (a) The system was designed for an individual crop in a set location. When the method was considered for a rotation across multiple blocks, properties and changing sites the information required is simply too great.

    (b) The data required by the Council is, in our view, likely to extend beyond what growers would be prepared to provide or practically could provide – particularly in relation to:

        i. Yields from every crop

        ii. Residual calculations for product not harvested

        iii. Phosphorus surplus.

    (c) While it would be desirable to calculate an aggregated surplus for CVP at the subcatchment or industry scale the data tools or aggregation infrastructure required does not exist.

    (d) A nitrogen “budget” or dashboard is being prepared by the sector. Mr Barber is able to discuss the concept more fully than I, and has discussed the development of this in his evidence. While the proposed N Budget dashboard developed by Mr Barber is a precise and simple one pager; the sum total for each crop across all properties and blocks over time would be a different matter. Some tool would be required to manage a combined output.

(e) So; in order to turn these budgets into a useful compliance tool, a method would be required to combine and normalise the sum of all nitrogen budgets over time to come up with a positive or negative trend. and this would be a substantive exercise that has not been undertaken by any organisation so far; to my knowledge.

(f) The data entry standards etc required to submit the information required to NZGAP for the compliance tool also do not exist for most crops; with the exception of potatoes maybe.

(g) After a substantive look at it, I consider the commercial vegetable sector would be building a model that looks a little bit like OVERSEER. In our view there would be just as much uncertainty in the tool. We are not suggesting there is not potential in the approach, we are simply not able to adopt the approach currently.

(h) Given the Officers and growers do not support the use of OVERSEER we need an alternative.

40. Officers have suggested deletion of the NRP for CVP in the Section 42A report:

> *"There appears to be justification for removal of the OVERSEER-based NRP requirement altogether for CVP, if only from an OVERSEER workability point of view. However, Officers are conscious that the CVP industry has not been able to suggest a generally accepted and available alternative. If a requirement to establish an NRP is removed for CVP, there still needs to be confidence that this would not compromise the achievement of the Vision and Strategy, the NPS-FM and the objectives of PC1. Officers consider that the required confidence has not been evident in the CVP discussions to date. Officers are hopeful that evidence will establish viable alternatives, so that an unwieldy or compromised solution does not need to be presented by Officers in the final recommendations."*[7]

41. In my view there are good reasons why the CVP sector have suggested the use of a nitrogen reference point calculated from a range of proxy farm systems as a measured nitrogen benchmark. HortNZ sought in submissions a method to work with Waikato Regional Council to establish a range of proxies representative of systems across the region; and has gone to the extent of proposing a method (attached to this evidence as **Appendix B**) to establish those proxies.

[7] Para 88 S. 42A report Block 3

42. These proxies should be designed to represent good farming practice; or perhaps more appropriately practice at the time of notification. In my view that would provide the baseline the Waikato community is seeking to ensure that progress against the targets in the Vision & Strategy can be measured.

43. The sector has approached Waikato Regional Council with implementation proposals (and this detailed method) since it was developed for the purpose and submitted to WRC in July 2018. No comments have been received back on the content of the method. Waikato Regional Council has rejected the offer to develop the proxies. I am unsure of the reasons for this and from my knowledge the reasons have not been stated. The Section 42A notes:

> *"For CVP, Officers understand there have been discussions between WRC and HortNZ about the use of an OVERSEER proxy tool[3], similar to the Environment Canterbury "N-Check" tool. However, Officers understand WRC implementation staff are not supportive of developing a similar tool for the Waikato.*"

44. No indication has been provided for why WRC implementation staff are not supportive. The S. 42A report is incorrect to suggest the sector has not provided an alternative. In my view it is not best practice for the sector to develop these proxies alone, without a partnership with Council staff. This partnership approach was adopted by HortNZ in Canterbury to establish the N-Check proxy regime.

45. In that case, Canterbury Regional Council staff were able to accept that the proxy approach did not provide evidence of mitigation uptake, because the farm plan process provided for that.

46. In my view there is also the consenting process in PC1 for CVP that provides a mechanism to establish site specific minimum standards and ensure good farming practice is implemented to an acceptable standard.

47. I disagree with the Officers that the sector has not established a suitable alternative and cannot support a nitrogen surplus approach; particularly one that has not been detailed in a method. In my view the farm proxy method is the only viable approach that has been adopted by another regional council.

48. I also disagree with the Officers about the need for a CVP nitrogen reference point. In my view a NRP is required for the reasons outlined in para 42 above. In my view incorporation of a method directing HortNZ and WRC to establish a series of suitable proxies is required within the plan. The Officers propose deletion of all methods that are non-statutory. I cannot support that for the reasons outlined above and for other reasons I will discuss below.

49. In the interim, because proxies have not been established, the next best alternative in my view is to utilise the systems analysed for the purpose of preparing the S. 32 report for PC1. Mr Ford discusses how these could be utilised in his evidence. In my view they should be placed in a schedule in the Plan to provide some transitional baselines until better proxies can be established. I note Officers do not oppose the establishment of these proxies over the life of the plan[8]. In my view insertion of a method is appropriate to ensure they are developed.

50. Similarly, the NRP required by Rule 3.11.5.5 for land leaving CVP must be defined; to make this a realistic requirement. Mr Hodgson has included this proposed method in his Attachment A.

Phosphorous surplus method and alternatives

51. In my view this is an impractical requirement as there is also no clearly defined method for calculating a phosphorus surplus. No other sector has identified a method either; nor are they required to prepare one.

52. I do agree though that management of phosphorus discharge is an important factor in achieving targets to enable the Vision and the Strategy for the Waikato River to be met. For commercial vegetable production the mitigations required to reduce phosphorus discharge relate to targeted fertiliser recommendations and other mitigations required to reduce erosion and soil loss.

53. Mr Barber and Mr Ford discuss this in detail and in my view the alternative approach to requiring a calculated phosphorus surplus is to rely on an analysis of the implementation of the good management practices. If Commissioners wished to ensure this would occur this could be added to the method I have proposed in para 49 above. Given the substantive research into sediment control funded by the commercial vegetable sector in partnership with local and central government, this would seem a sensible option.

PROBLEM ANALYSIS: NEW CVP OPERATIONS

54. There is no pathway within the proposed provisions for new CVP. The track changes version provided with the s42A report for Hearing Block 3 does not align with what is suggested in the text of the Officers Report. It is clearly envisaged in the text[9] that any new

[8] S 42A Block 3 Paras 60,61.

[9] S.42A Block 3 Paras 28 and 30.

commercial vegetable production would be non-complying. But the new form proposed in the Block 2 Section42A report[10] notes:

Rule 3.11.5.7 - Non-Complying Activity Rule – ~~Land Use Change~~

The use of land for farming that does not meet [condition (5b) of Rule 3.11.5.3 or] condition (7) of Rule 3.11.5.4 is a non-complying activity. [106]

~~Notwithstanding any other rule in this Plan, any of the following changes in the use of land from that which was occurring at 22 October 2016 within a property or enterprise located in the Waikato and Waipa catchments, where prior to 1 July 2026 the change exceeds a total of 4.1 hectares:~~

~~1. Woody vegetation to farming activities; or~~

~~2. Any livestock grazing other than dairy farming to dairy farming; or~~

~~3. Arable cropping to dairy farming; or~~

~~4. Any land use to commercial vegetable production except as provided for under standard and term g. of Rule 3.11.5.5 is a non-complying activity (requiring resource consent) until 1 July 2026.~~

~~**Notification:**~~

~~Consent applications will be considered without notification, and without the need to obtain written approval of affected persons, subject to the Council being satisfied that the loss of contaminants from the proposed land use will be lower than that from the existing land use.]~~[107]

55. In my view the Officers have assumed the non-complying pathway still exists in the plan as it has evolved. That is why the Officers have proposed that new CVP is enabled through an "offsetting mechanism"[11].

56. Officers have proposed that offsetting deserves more policy support to "enable the expansion of existing commercial vegetable production operations or new entrants"[12]. No policy support has been provided in the strikethrough. It is also questionable whether the proposed offsetting approach is either practical or desirable; given that it would have the result of substantively increasing the cost of producing vegetables for domestic consumption.

57. The commercial vegetable production sector currently has no ability to consent new production in two of the key producing regions of the country[13]. If the proposal for PC1 remains in the current form that will be the third region. In my view the cumulative effects of these policy approaches are creating a greater risk to community wellbeing than the effects they are seeking to manage. I have seen nothing to change my view stated in my evidence to Block 2 hearings; that a reasonable and practicable pathway for new vegetable production must be provided. For that to occur there has to be some fundamental shifts in the views of the Officers.

[10] S 42A Block 2 Page 46

[11] s42A Block 3 Para 99.

[12] s42A Block 3 Para 99

[13] Horizons Region and Canterbury Region.

58. I have observed the horticulture sector's attempts to establish an appropriate regulatory pathway to manage effects responsibly for the last 15 years. The fact that a practical solution has not been found is evidence of the significant difficulties encountered. A key difficulty in all three regions has been the measurement of the discharge at a "per hectare" basis that fails to recognise the overall scale of effect the sector has.

59. The focus on nitrogen is even more problematic for the sector. The sector has certainly not been backward in developing comprehensive good practice approaches, encodifying them and measuring their effectiveness. However, the sector has lacked a sound reporting structure for the practices adopted, and the reporting structure is difficult to develop[14].

60. I agree with Officers that the sector has to demonstrate that it is "doing its part".[15] But I do not consider that the approach suggested by Officers is a balanced policy response that is required to make sure the sector is exhibiting sound environmental stewardship. I cannot see how the policy approach recognises that the activity produces no bacteriological discharges, is small in scale and has significant wellbeing benefits in terms of New Zealand food supply.

61. In my view there are several objectives and policies within the Regional Policy Statement that are relevant considerations in a decision to enable existing and new Commercial Vegetable Production.

    (a) Objective 3.6: Climate change adaptation: The objective is to manage land use activities in a way that avoids adverse effects from climate change. Providing for the replacement of animal-based farming with cropping options is one such alternative being promoted by Government to address greenhouse gas emissions. Ms Sands covers this in her evidence to Block 2 Hearings for PC1. Objective 3.6 is supported by detailed Policy 4.1 describing the need to adopt an integrated approach for managing natural and physical resources. Policy 4.1 notes the need to recognise multiple values such as "ecosystem services". Ecosystem services are defined to include "*provisioning services such as food and water*".

    (b) Objective 3.8 relates to ecosystem services. The Objective seeks that "The range of ecosystem services associated with natural resources are *recognised and maintained or enhanced to enable their ongoing contribution to regional*

[14] In particular for the vegetable sector where there is no generic or homogenous customer requiring these to be reported in a consistent way.

[15] s42A Report Block 3 Para 98.

wellbeing". Policies designed to give effect to the objective that are of relevance include:

i. Policy 4.4 in relation to regionally significant industry and primary production.

ii. Policy 8.1 in relation to identifying values for freshwater bodies and developing approaches to management of freshwater.

iii. Objective 3.26; and Policy 14.1: Maintain or enhance the life supporting capacity of the soil resource.

iv. Policy 14.2 High class soils.

(c) Like many others I have observed the comments being made about the relevance of Policy 4.4 in relation to Regionally Significant Industry – the definition requires these to be identified in regional or district plans. I have not checked all the plans but I note the Waikato District Plan (Issue 1.5) identifies horticulture as a significant industry. The existence of this policy is a matter for regard but in my view the other policies and objectives listed above provide enough support alone to give effect to an exception regime for commercial vegetable production. The proposed exception regime is described briefly below and covered in more detail in the evidence of Mr Hodgson.

62. In hearings for Block 2 HortNZ was also asked to address the relevance of Policy 17 in PC1 to the proposal being put forward by the commercial vegetable sector. HortNZ sought that the policy was retained in submissions and further submissions.

63. Policy 17 seeks consideration of the wider context of the Vision & Strategy beyond the focus of Chapter 3.11. It states:

"When applying policies and methods in Chapter 3.11, seek opportunities to advance those matters in the Vision and Strategy and the values^ for the Waikato and Waipa Rivers that fall outside the scope of Chapter 3.11, but could be considered secondary benefits of methods carried out under this Chapter".

64. I consider that enabling CVP in the manner proposed by HortNZ could be considered to have secondary benefits. In my evidence to Hearing Block 2[16] I noted the historical cultural connections to

[16] Chris Keenan EIC Block 2 paras 38-42

gardening in the Waikato, and referred to the wider overall benefit to communities.

65. I have reviewed The Vision, Objectives and Strategies in Schedule 2 of the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010. In my view the Vision is clear that the restoration and protection of the Waikato River is the paramount Objective, but it is also designed to empower the Waikato community more generally in terms of the future, and the health and the wellbeing of the community.

66. If an opportunity to provide for additional CVP can be defined within the plan that ensures the Objectives can still be met I consider Policy 17 gives particular support to enabling that approach.

COMPARING THE PROPOSED REGIME FOR EXISTING AND NEW CVP WITH THE REGIMES FOR OTHER FARMING ACTIVITIES.

67. Proposed Rule 3.11.5.1A provides, until 2021 (or a date 6 months after the plan becomes operative), for any activity in a Priority 1 catchment as a permitted activity. The exception is existing CVP. Existing CVP has to apply for restricted discretionary consent by 2020 if the plan has become operative, or for a controlled activity consent if the plan is still being challenged.

68. I consider that it would be reasonable to expect this interim rule as it relates to Priority 1 catchments should apply to CVP; because otherwise in my view we will see submission of many applications later this year under a policy and rule framework that may still be some way from being determined. These applications would need to be made under the regime proposed on plan notification.

69. Activities other than commercial vegetable growing in Priority 2 catchments have until 2025. Priority 3 catchments have until 2026. HortNZ have sought not to delay implementation in order to show good faith in achieving the Vision and Strategy. I see little in the proposals to recognise early adoption of the regime by the sector.

70. Arable farming was notified as a permitted activity under the plan. The Officers are proposing controlled activity status for the pastoral sector. I cannot reconcile the proposals of the Officers for CVP with the approaches for other sectors. There are also a range of exemptions proposed for activities such as point source discharge, new urban development and infrastructure development.

PROPOSED ALTERNATIVE FOR EXISTING CVP

71. In my view a controlled activity status is appropriate for existing commercial vegetable production. This concurs with the evidence of

Mr Hodgson and is supported by evidence from all the other experts for Horticulture New Zealand. It is also supported by the Objective and Policy framework in the operative RPS. In my view the matters of control and standards / conditions for the Rule must incorporate the following performance measures:

(a) Documentation and audit of all environmental practices adopted through NZGAP and the FEP.

i. In my view It is important to retain the table of minimum standards for CVP as described in the notified FEP schedule. These are proposed for deletion in the updated proposal for Block 3. Mr Hodgson has included these in his strikethrough.

ii. In my view there is an additional minimum standard that should be listed in the table as proposed in the HortNZ submission. This relates to applying irrigation efficiently to maximise yield and the uptake of nutrients by the crop, as an effective discharge mitigation.[17]

iii. I also consider it is advisable to adopt the proposed refinement of the FEP Schedule as it relates to CVP; in line with the proposed content suggested in the HortNZ submission. However I note that Mr Farrelly has proposed a less intrusive approach and proposed alterations to the new WRC FEP Schedule to incorporate the requirements for CVP FEP's. In my view either would be acceptable alternatives.

(b) Adoption of a proxy nitrogen benchmark developed according to the proposed method over the life of the plan by WRC, HortNZ and other required parties.

i. Prior to development of these proxies a series of defaults have been suggested in line with the reasoning I have provided above in paras 48-49. Mr Ford describes the proposed defaults in his evidence.

(c) Construction of a comprehensive Farm Environment Plan in coordination with a certified farm plan adviser for CVP operations. Several definition changes are suggested in

[17] The science demonstrating the importance of this mitigation is described in The First Jacobs Technical Report Section 4.2 P. 26 http://www.hortnz.co.nz/assets/Natural-Resources-Documents/Healthy-Rivers-Plan-Change-Technical-Report-for-HortNZ-sub.pdf

the submission and Mr Farrelly discusses this more completely in his evidence as does Mr Ford and Mr Barber. Mr Barber has proposed a new definition for CFEP (Commercial Vegetable Production). I do not envisage the current definition of CFPA is at all useful for CVP given the focus on expertise in use of OVERSEER.

(d) An ability to transfer farming activities within an FMU as long as the subcatchment increases by no more than the benchmarked cap established to provide for the provisional CVP growth area.

(e) A nitrogen reference point provided for land that is no longer utilised for CVP from a table in the Farm Plan Schedule; based on the average kg/ha with the load calculated as total benchmarked load for land identified as suitable for CVP in each sub-catchment minus the benchmarked load for CVP within the sub-catchment, and the ha (being those identified as being suitable for CVP.

(f) An allowance for CVP operations to be treated as a single enterprise within an FMU requiring one consent.

(g) Provisions for operation of the discharge authorisations between land parcels within the land use consent rule. I note that Officers suggest this is not allowable due to RMA compliance issues[18]; and Ms Atkins will address this in her legal submissions.

PROPOSED ALTERNATIVE FOR NEW CVP

72. In my view a restricted discretionary activity status should be provided for new commercial vegetable production that can demonstrate is complies with the established cap or reservation in each subcatchment for New CVP.

(a) Ms Sands and Mr Easton have provided the methodology for establishing these caps and the reasons for their scale / volume. My understanding is they are extremely limited opportunities, designed to compensate for:

i. land lost from production due to urban expansion; and

ii. for population growth to 2030 (nominally the life of the plan).

[18] Section 42A Block 3 para 110

73. In my view this growth can only be justified if it can be demonstrated that progress can be demonstrated towards meeting the targets within the Vision and Strategy for the Waikato River. Mr Easton and Ms Sands have covered this in their evidence; and a series of proposed changes to Schedule B PC1 have been included in an Appendix to the evidence of Ms Sands.

74. In my view the activity must be supported by:

    (a) Changes to the proposed Policy 3,

    (b) Incorporation of the statutory and non-statutory methods referred to in the plan provisions proposed by Mr Hodgson; and

    (c) The farm plan schedule attached to that strikethrough and other associated definitions. There should be a link back to Policy 1 to clarify what policies apply to CVP operation under the CVP policy and rule framework.

75. The Rule must provide guidance on the land that can; or cannot be used for new commercial vegetable production. In my view it is useful to consider the concept of nitrogen sensitive land following the logic in the Wairakei Pastoral proposals for the identification of high-risk nitrogen loss land.

    (a) A description of land that is suitable for CVP, to facilitate the calculation of the background load applied and to assist with the calculation of the NRP;

    (b) A method describing the NRP to be applied to land when CVP moves off land and it reverts to another use.

    (c) A regional land area cap; taking into account:

        i. Compensatory balance for land zoned as future urban in the Auckland region currently being utilised for commercial vegetable production.

        ii. An allowance for population growth over time to 2030 in the Auckland and Waikato Regions

    (d) A maximum increase allowance per subcatchment to limit localised effects such as there may be in the Whakapipi where the current area of CVP is unusually high.

    (e) CVP policy that provide a “reservation” of nutrient discharge entitlement for new CVP based on the established Defaults described by Mr Ford and a requirement to demonstrate that the discharge does not exceed the benchmark cap of the subcatchment.

(f) A “reasonable use test” to ensure that applications for new CVP are undertaken by parties that will utilise the authorisation within a certain and agreed timeframe.

(g) All new CVP would be required to operate at Best Management Practice in addition to demonstrating compliance with the standards and conditions of rules for existing CVP. In my view the proposed definition for Best Management Practice described in the s42A is appropriate for this.

76. Mr Hodgson has also described a proposal for a discretionary activity Rule for applications that exceed the cap but propose to “offset” effects through retirement of land or some other mitigation as proposed by the Officers in the Section 42A report. I consider this is an option that would rarely be used given the expense but there is not valid reason to prevent it as an option.

77. I would also suggest that the default through to 3.11.5.7 be re-established to ensure that any application that could not be made under any of the proposed CVP methods is a non- complying activity and that the conditions of Policy 1 would apply.

CHANGES TO THIS PLAN THAT MAKE PC1 LESS “TRANSITIONAL”

78. Officers have proposed wholesale deletion of the non-statutory methods and removal of the “future allocation” policy (Policy 7). I consider both of these changes to be undesirable and unreasonable.

79. Removal of the non-statutory methods leaves a significant amount of uncertainty in relation to the Council’s commitments to support implementation of PC1. Officers have noted often that PC1 was developed through the CSG. As a member of the CSG I am aware of the reasoning for the proposed methods and Policy 7.

80. The CSG was very aware of how difficult it would be for the Waikato community to implement proposed PC1 and to meet the longer-term targets for water quality in the Waikato River. The Policies, Objectives and statutory methods chosen were acceptable as a package because of the commitment by Council to a programme of work to develop tools and capacity to implement the plan change and prepare for even bigger changes in the future.

81. In my view the removal of methods provides no certainty that the Council will be required to complete significant pieces of work, such as:

(a) a holistic contaminant accounting framework for the Waikato River;

(b) work to encourage collective action within subcatchments;

(c) to allocate funding and staff resources to the implementation of PC1;

(d) to develop the tools to allocate the responsibility for discharges at a finer scale;

(e) to support the development of good and best management practices that support the Objectives of PC1; and

(f) Monitoring and evaluation of plan implementation.

82. In my view PC1 is not complete without the non-statutory methods. The farming community is provided with no certainty about the direction of the Council. I am of the view that they should be retained with corrections as proposed by submitters if these are considered useful by Commissioners.

83. Policy 7 and methods 3.11.4.7, 3.11.4.8, were specifically designed to indicate that the current plan was a transitional process designed to prepare the community for broader change. A key issue for the CSG was the allocation of nutrients and contaminant discharges.

84. There was an unwillingness in the CSG to see the transitional measures locked in stone as a “primary allocation” process. From my perspective there were a number of issues that pointed to the need for a transitional approach to managing discharges:

(a) The need to focus on implementation of good farming practice and farm environment planning.

(b) The need to demonstrate progress towards achieving water quality targets.

(c) The need to construct more certain and useful accounting tools at the catchment and subcatchment level; to provide guidance / information aimed at ensuring subcatchment loads and water quality targets could be met.

(d) Lack of resolution of iwi rights and interests in freshwater.

(e) Lack of flexibility to increase the efficiency of resource use (largely because no trading / transfer system has been developed for nutrients; and the non-complying activity rule prevents certain activities).

85. I do believe the current proposal to delete the methods and Policy 7 leaves the community with PC1 as a longer-term allocation structure by default. The removal of the 2026 sunset clause for Rule 3.11.5.7 has removed one of the key assurances for the farming community that further work would be completed to support a more flexible

approach to managing discharges. In my view, an approach that allows the rural community the greatest flexibility possible in meeting the Objectives of the Vision and Strategy has the greatest opportunity to succeed.

86. Many matters of significance to a robust approach to allocation have not been considered, including:

(a) Whether discharge rights should be allocated to people, land or legal entities;

(b) Who or what discharge rights would accrue to (for example urban land vs rural land);

(c) How should the balance of discharges across the four contaminants be assessed in terms of any discharge "right" being allocated;

(d) What the terms of any market would be for exchanging rights and how it would be regulated.

87. Officers have selected an allocation method that focusses on grandparenting nutrient discharges to the benchmark nitrogen score measured prior to the plan, then allocating those discharges to land[19]. In my view this effectively locks current discharge patterns in place; particularly as no ability to transfer discharges is provided.

88. This will have a "chilling effect" on the rotation of vegetable cropping activities. It also places all the power in commercial negotiation on a lease in the hands of the lessor. In my view this will have a chilling effect on land lease opportunities more generally. It also imparts a "property right" to a landowner based on the activities present at the time of the plan – in my view this is neither efficient or scientifically justifiable; as the activity may have been completely unsuited to that location for environmental reasons.

89. In my view it is appropriate for Policy 7 to remain within the plan even if it represents an aspirational goal that may be replaced by an alternative policy developed with more consideration in the future. It presents clear evidence that the current approach is a transitional measure and that a better instrument for managing achievement of the Vision and Strategy is being prepared.

REJECTION OF THE SUBCATCHMENT PLANNING METHODS PROPOSED

90. HortNZ proposed a subcatchment collective approach in some detail and I have attached the proposed process as **Appendix C**.

[19] s42A Block 3 para 103.

There has been no analysis from the officers in respect to the detail of this proposal, although the Officers note that the proposal was provided[20].

91. The basics of the proposal are listed as follows:

(a) A consent could be applied for to manage a proportion of a subcatchment as a collective;

(b) The collective would need to be a legal entity;

(c) The consent application must be supported by detailed proposals (a subcatchment scale water quality management plan) for the land area within the "command" of the collective;

(d) A supporting decision support tool of suitable robustness be put forward to support the management approach adopted.

92. The Officers have not provided any detail on why they consider this to be an ineffective method and the deletion of the "enterprise" concept has made it very difficult to see how any proposal at a greater level than an individual farm would be enabled. As Mr Barber has pointed out in his evidence to Block 2; collective management is often the most successful ingredient to success in achieving water quality outcomes.

93. In putting forward the catchment collective option I am also mindful that the number of farm plans and consents the Council will have to manage is vast; by any assessment I have seen in New Zealand. I am concerned that without tools within the plan to provide for collective consenting and management at greater scale; implementation of the plan will be confounded by the burden of monitoring the implementation of farm plans.

94. Officers note that there is nothing within the plan to prevent a subcatchment planning approach be adopted, but I note there is nothing in the plan that would enable or encourage it. In my view the approach requires a regulatory framework to enable it.

95. I also note that Officers are concerned about the proposed restricted discretionary rule framework to enable a subcatchment management approach. While I consider a Restricted Discretionary Activity could be developed that would be appropriate, I consider a discretionary activity pathway could be adopted as well.

[20] s42A Block 3 Paras 146, 147.

NEW NITROGEN DISCHARGE ESTIMATES FROM THE KIWIFRUIT SECTOR, AND THE DEFINITION OF FRUIT AND VEGETABLES

96. In my evidence to Block 2 I submitted data provided in a report completed by Zespri regarding the characteristics of nitrogen discharge from kiwifruit properties across NZ. Since that evidence was submitted I have been made aware of a new report that is more recent and up to date. I have attached this report as **Appendix D** to my evidence.

97. I have reviewed the information in the report. I note that a slightly higher discharge of N from kiwifruit operations has been estimated for the Waikato on a number of soils.

98. Nothing in the revised information changes my view that fruit production is a low intensity activity for the reasons I stated in my previous evidence to Block 2.

99. I also note there is a query regarding what a suitable definition would be for "fruit production" if it was to be defined as a low intensity activity. The definition of "fruit" is somewhat unhelpful as the definitions tend to vary depending on whether the growing activity or consumption is the focus. There are two options to a definition of fruit:

    (a) Botanical - meaning anything that is produced that bears a seed – this would of course include a great deal of vegetables such as pumpkin, squash, courgettes and tomatoes.

    (b) By taste - meaning any fleshy item that is sweat to the taste. Obviously this definition also has administrative difficulties for the plan.

100. In constructing the definition for commercial vegetable production within the plan, the definitions within the Commodity Levy Order for Vegetable was used. The most recent commodity levy order[21] was established in 2019 and includes definitions for fruit and vegetables. If a definition was proposed for fruit I would suggest it is useful to start with this list and consider what the levy order does not include. The definition is:

> "**fruit** *means the following fruit grown in New Zealand for commercial purposes (including commercial processing):* ***(a)*** *apples, Asian pears, avocados, babacos, blackberries, boysenberries, casanas, cherimoyas, citrus (including grapefruit, lemons, limes, mandarins, oranges, and tangelos), European pears, feijoas, guavas, kiwifruit, kiwiberries, loquats,*

[21] http://www.legislation.govt.nz/regulation/public/2019/0039/9.0/LMS157118.html

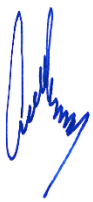
*passionfruit, persimmons, quinces, sapotes, summerfruit (including apricots, cherries, nectarines, peaches, and plums), and tamarillos; and **(b)** the hybrids of the fruit listed in paragraph (a)*"

101. In my view this could be adopted or a version if some changes are made and some notable exclusions from this definition are provided for: in particular some berry crops do not fall under the levy order and some others are excluded as not being commonly grown. I would suggest the following definition of low intensity horticulture to be suitable for the purposes of the plan:

> "**Low Intensity Horticulture**: Including asparagus, vegetables grown under cover, legumes grown in arable rotations, all berries not included in the definition of vegetables, and fruit.
>
> **Fruit:** for the purpose of defining low intensity farming activities in Chapter 3.11 means the following fruit grown in New Zealand for commercial purposes including commercial processing): **(a)** apples, avocados, babacos, berry crops, casanas, cherimoyas, citrus, feijoas, figs, guavas, kiwifruit, kiwiberries, loquats, passionfruit, pears, persimmons, quinces, sapotes, summerfruit (including apricots, cherries, nectarines, peaches, and plums), and tamarillos; and **(b)** the hybrids of the fruit listed in paragraph **(a)**".

102. The definition of vegetables is also discussed in the Officer report[22]. I note that Ms Sands has provided evidence in relation to asparagus cropping being excluded from the definition. I also note that while a definition is proposed in the text of the S. 42A report one has not been proposed in the strikethrough of plan provisions.

103. I consider the revised definition is useful to consider as an option for PC1 and agree with the conclusions of the Officers in respect to indoor crops and a simplified list. If the Commissioners were considering the adoption of a revised definition; I consider the definition discussed on page 23 of the s42A could appropriately be used.



Christopher Keenan
9 July 2019

[22] Section 42A Block 3 Section C1.8.3 p 21

Appendix A EIC Chris Keenan - Draft N Surplus compliance tool system for CVP based on the N surplus ratio approach proposed by Plant and Food– PC1 1/7/2019

This method is my best attempt to develop a system to measure N surplus then adapt it for use as a compliance tool for PC1.

DATA INPUTS

Irrigation data supplied from water "use" information requirement

Climate data? S- Map? Other?

Fertiliser inputs (N + P)

Documented mitigations applied

OVERSEER? (For stock component)

Standardised N, P Soil test prior to planting

- W shape / random?
- No. of samples per test
- Samples taken at what depth?
- Crop yield measure obtained.
- Residual calculated (N returned)
- Planting / harvest date
- Soil type
- How is this able to be linked to sed. mitigations?

Erosion and sediment control measured

- Digital block/paddock assessment?
- Evidence of maintenance and design to meet threshold supplied

Stock exclusion protocol?

- Compliance with PC1 stock exclusion rules demonstrated

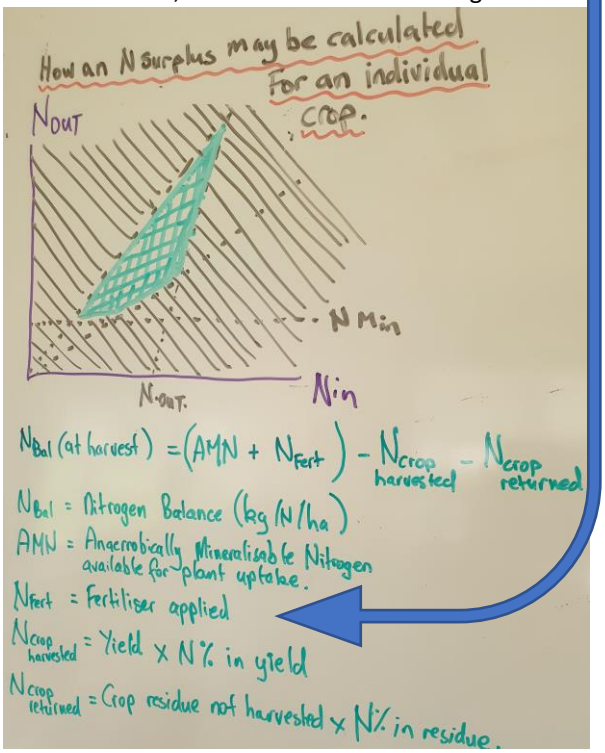
Data Locker

- Data confidentiality assurance
- Certain data approved for release to third parties for compliance purposes

Fertiliser Reccs (Plant and Food) – N reccs from Guideline

Dashboards produced

- Data entry methods developed (metadata standards).
- Quality assurance for data collected is applied.
- Production of N, P and Soil Dashboards for growers



Compliance Tool

- The sum of N Balances for each crop planted (block scale? Enterprise scale?) on a five-year rolling average should be less than or equal to the summed N Balances for the previous five years (calculated each year?)
- For a positive compliance outcome, over all crops and blocks, the N ratio must exhibit a net increase in the occurrence of "green" results if the number of "green" outcomes are below a certain percentage. ***This percentage needs to be determined and justified as the minimum performance standard for the plan***.
- The NZGAP compliance tool will automatically calculate the net result and provide it to the grower and the regulator.

Erosion and sediment control + phosphorus

- Digital block/paddock assessments reviewed by Certified Farm Plan adviser every five years. (*What is a suitable compliance metric??*).
- Paddock assessments for new land in the enterprise provided to the Council to demonstrate the implementation of mitigations.
- Evidence of maintenance supplied on an annual basis

APPENDIX B EIC CHRIS KEENAN BLOCK 3 HEARINGS PC1 9/07/2019

27 July 2018

TO:	Waikato Regional Council
SUBJECT:	Strategy for developing proxy nitrogen benchmarks for commercial vegetable growing in the Waikato Region
FROM:	Horticulture New Zealand

Purpose:

1. Estimating nitrogen losses from commercial vegetable production has proved challenging in many regions due to the complexities of rotation, the pastoral focus of traditional nitrogen leaching tools such as OVERSEER™; and the fragmented nature of commercial vegetable production enterprises.[1]

2. Horticulture New Zealand is suggesting that Waikato Regional Council work collaboratively with the industry to establish a series of nitrogen leaching proxies to simplify estimation of nitrogen losses from differing commercial vegetable production systems. Environment Canterbury recently approved[2] the N-Check tool[3] that was developed by industry and the Council first hand experience of the difficulties with the use of OVERSEER™ in rotational cropping.

Method:

3. Vegetable production systems can be aggregated into standardised rotations that simplify the crop mix and seasonal variation based on differing intensities. Growers choose the standard rotation that is the best fit for their operation; and select the locations the enterprise is operating across.

4. The proxy establishes a nitrogen benchmark using a method approved by the regional council, based on actual measurement of nutrient loss from reference sites and/or farm data evaluated in Council approved modelling tools[4] such as OVERSEER™ or APSIM[5]. The farm data utilised is usually established by survey of a range of farms; and / or is cross checked by an expert group that can verify fertiliser practise and rotation sequence for a series of proxies that are as close to actual practise as possible.

5. Proxies will require periodic review as systems change over time and more information becomes available regarding standard practice and actual measurement of discharges.

6. Good management practices that can influence discharges from cropping can be added over time into APSIM or OVERSEER, but currently very few practises are included in these models. So modelled losses are not currently reflective of good or poor practise. The best

[1] These operate across multiple blocks of land that are not only owned, but also shared and leased on a temporary basis.
[2] https://www.ecan.govt.nz/get-involved/news-and-events/2017/tool-for-farmers-to-measure-nitrogen-loss-rates/
[3] https://www.newzealandgap.co.nz/assets/Uploads/Ncheck-Short-Guide-v6.pdf
[4] Both models have been used. It is possible to utilise OVERSEER because the rotation is standardised. However it is likely that proxies established using APSIM will be more accurate for crops with a short rotation period. It may be acceptable to use proxies established using either model.
[5] http://www.apsim.info/

way to ensure losses are minimised is to measure the implementation of confirmed good practises through the implementation of the farm plan.

Suggested process for establishing a series of proxies:

7. The following steps are suggested for establishing a series of proxies and estimates of nutrient leaching suitable for use in consent application and registration for the Healthy Rivers Plan for Change implementation:

    a. Establish a working group including the following representation:
        i. Waikato Regional Council implementation and policy staff
        ii. Horticulture New Zealand representative
        iii. Representatives of Pukekohe Vegetable Growers Association[6]
        iv. Technical experts acceptable to regional council and industry[7]

    b. Have an initial meeting to scope the terms of reference for the project with the technical advisors and growers. The reference group established should be consulted regularly at milestone points in the development of the project objectives.

    c. Establish the number of proxies required to represent the variety of systems required to represent commercial vegetable production in the Waikato. Ideally this would include rotations typical of the Pukekohe / Pukekawa districts; production in the Cambridge District (asparagus and short rotation leaf crop) and arable horticultural rotations in the Matamata Piako districts.

    d. Review current data and see if there is a requirement for additional information to inform the production of proxies. More information has been provided below in paragraph 8.

    e. Choose a modelling platform that can be supported by growers and Council to finalise the proxies and prepare nutrient leaching estimates for a number of test properties.

    f. Utilise the soil water balance model developed by Aqualinc for the Waikato[8] to develop a matrix of soil, climate and rainfall information[9] to allow for the use of proxies at different locations in the Waikato. An example of how the matrix could look is as follows:

	Climate / Soil 1	Climate / Soil 2	Climate / Soil 3	Climate / Soil 4	Climate / Soil 5
Proxy 1	X[10] kg/N/Ha/Yr	Y kg/N/Ha/Yr			
Proxy 2		Z kg/N/Ha/Yr			
Proxy …					

    g. Use the lookup table matrix of indicative nitrogen[11] benchmarks to populate nitrogen reference points automatically when growers enter property level information in the registration portal.

[6] Initially I would suggest 2 growers from larger enterprises and 2 from medium to small enterprises.
[7] Initial suggestions would be Jon Palmer, EW; Stuart Ford (Agribusiness Group Ltd.). Some support from Plant and Food may be required but not initially.
[8] https://www.waikatoregion.govt.nz/services/publications/technical-reports/tr/tr201625
[9] There are many variations of soil, climate and rainfall so some technical work will need to be completed to develop and aggregated spatial map that can usefully clump spatial information based on discharge risk.
[10] A range may be more desirable than a discrete value, but this would need to be decided during the project.
[11] Potentially it is preferable to undertake this for phosphorous as well.

h. Peer review the process and establish approvals for use of the method for consent application.

i. Determine a review period and process to update the proxies based on continued research.

8. In Canterbury, ~9 proxies were established from information collected[12] to support the Matrix of Good Management Project[13]. This was a detailed and comprehensive science project that has co-benefits for constructing similar proxies in the Waikato Region. Three proxies were also established using a very similar process in the Waikato, to support the Waikato Economic Joint Venture Project[14] that initially quantified the nutrient losses in three differing intensity standard rotations. In addition, 9 other case studies have been prepared recently by Horticulture New Zealand for Plan Change 1 evidence that could be utilised to inform the project. Potentially, as few as six and as many as ten proxies may be required. The number of proxies would depend on the level of variance encountered in system type.

   Some suggestions would be as follows:
   a. Traditional market garden
   b. Arable / vegetable rotations x 3 for differing crop representations
   c. Short term leafy green crop rotations
   d. A rotation or 2 rotations including stock in the rotation (light / heavy)
   e. Asparagus production

Suggested timeframes for completion:

9. The timeframe required for completion will depend on the extent of variance within the finalised matrix. The smaller the number of categories, the quicker the process will be. Registration with WRC is required after1 May 2020. Ideally the tool would be available for incorporation within the registration portal.

   The Horticulture NZ submission to PC1 provides scope for the changes that might be required to assure the process is incorporated:
   a. Suggested amendment to Policy 2 (HortNZ submission p. 26)
   b. Suggested amendment to Policy 3 (HortNZ submission p. 27)
   c. Suggested amendment to Method 3.11.4.7 (HortNZ submission p. 38)
   d. Suggested amendment to Controlled Activity Rule 3.11.5.5 (HortNZ submission p. 44)
   e. There are also other references to establishment of proxies within the submission.

10. It should be possible to establish a proxy matrix within a 12 month period if the appropriate resourcing is provided.

[12] http://www.massey.ac.nz/~flrc/workshops/14/Manuscripts/Paper_Williams_2014.pdf
[13] https://api.ecan.govt.nz/TrimPublicAPI/documents/download/3014136
[14] http://www.hortnz.co.nz/assets/Uploads/nutrient-performance-and-financial-analysis-of-lower-waikato-horticulture.pdf

APPENDIX C EIC CHRIS KEENAN BLOCK 3 PC1 9 July 2019

A catchment collective approach to managing contaminants: Variation 1 to Waikato Healthy Rivers PC1 22 May 2018

Background:

The Horticulture New Zealand submission on PC1 contains elements supporting a catchment collective approach. This short paper and attached diagram explains how it may work. It has been prepared initially to engage with growers to establish support for the approach but is designed to be applicable to any business affected by; and responsible for outcomes sought under proposed Healthy Rivers PC1.

Basic outline of approach:

1. The Waikato is split into subcatchments under PC1. HortNZ has proposed a table of subcatchment loads based on the science provided by the Technical Working Group to the Collaborative Stakeholder Group process (CSG). *These subcatchment loads provide an opportunity to manage the responsibility for contaminants at the subcatchment scale, as opposed to individual farms*. It allows for the community to manage effects collectively and take advantage of shared responsibility to increase the flexibility of land use activity.
2. It will be very hard to get all businesses in a subcatchment to agree to work collectively so it is *proposed that a minimum of 20% of the land area would be required to start a collective approach. The responsibility for achieving subcatchment load targets could then be divided proportionately*. See the footnote below for the proposed method to undertake the reallocation of responsibility.[1]
3. This approach *requires the formation of a legal entity responsible* for managing things. The relationship between the legal entity and those represented by the entity would be supported by a contract under civil law outlining the rights and responsibilities of each party.
4. Funding will be required to establish a collective approach, because the legal entity will have to establish a tool and methods to track progress and support the development of an Integrated Catchment Management Plan (ICMP) by parties involved. *Funding responsibility will need to be managed by the civil contract between the legal entity and the other parties*.
5. *A decision support tool must be developed*. This tool is basically a catchment model that is capable of predicting the effectiveness of identified actions or mitigations to achieve the ten-year subcatchment load targets specified in the plan. A minimum standard for decision support tools is specified in the HortNZ submission. At a minimum they must be able to assess the outcome and probable reductions across all four contaminants. The decision support tool must be:
    a. able to be used by the Council as part of managing the overall Waikato River
    b. able to provide evidence to support a package of mitigation actions specified in an ICMP
    c. developed and approved by respectable scientists approved to do so.
    d. Able to continuously improve as better information becomes available from monitoring

[1] The legal entity could receive a proportion of the relevant subcatchment load limit, that would be calculated by the decision support tool. The limit allocated to the legal entity could be based on the area of land and the proportion of the relevant subcatchment load targets (estimated in HortNZ submission Schedule 1C Table XX).

6. The legal entity will *use the ICMP and decision support tool to apply for an integrated consent covering the land specified in civil contracts agreed by participating parties.* The consent would cover enough time to allow for improvements to be measured and would reflect the investment in the decision support tool and the package of mitigations.
7. The legal entity would be *required to monitor and report progress under the ICMP to the Council who would be able to take any required enforcement action against either the legal entity or parties that have breached conditions of contract*. The consent could be reviewed and altered if the targets are not being achieved; or if the targets are being achieved quicker than expected.

Pros and Cons of the proposed approach

Council		Participating parties	
Pros	Cons	Pros	Cons
The Council will have a greatly reduced group of consent holders and farm plans to manage.	The Council will need to develop a strong relationship with the subcatchment communities and support the development of catchment collectives.	The parties to a catchment collective will have support to manage mitigations and actions and report progress to Council.	The parties will have to agree to pay a fair share of the development and consenting costs incurred by the legal entity.
The Council will benefit from the development of decision support tools to monitor the River. These tools will allow far more sophisticated approaches to be taken in the longer term.	The Council will be required to invest in a framework that can manage all of the subcatchment based tools as an integrated tool to manage the entire Waikato River. This will require investment in science, data and information handling.	Farm Plans will be far more tailored to individual properties and the contaminants of concern to achieve the best results for the best price.	The establishment of a legal entity under contract among many parties will be complex and difficult to achieve. It will require the community to work together in a way they have not before. This will require some support from the Council.
The Council can obtain greater benefit in terms of positive water quality outcomes because a wider range of effective mitigations become available by working collectively at an enterprise level as opposed to a property level.	The Council will require the ability to manage a more sophisticated set of mitigation packages, alongside the community that choses not to participate in a catchment collective. For this reason the allocation regime should incentivise catchment collectives.	Commercially confidential information required to assess load reductions will not enter the public realm unless enforcement action is required by the Council. The rest of the information can be managed by the legal entity that is not subject to LGOIMA.	Any allocation of contaminants will be allocated to the entity not to any party within the collective. Procedures will have to be established for new parties entering or old parties leaving the collective.
Council and Iwi will have a range of resourced legal entities to work with on progressing achievement of the Vision and Strategy for the Waikato River		The flexibility to change land use will be increase between participants in the catchment collective, because the discharge outcomes a can be assessed and managed in a far more effective and sophisticated way.	No party will be able to abdicate their responsibility for undertaking improvements. They will have greater flexibility to manage how improvements are achieved though.

Diagram showing how the proposed collective sub catchment approach would work

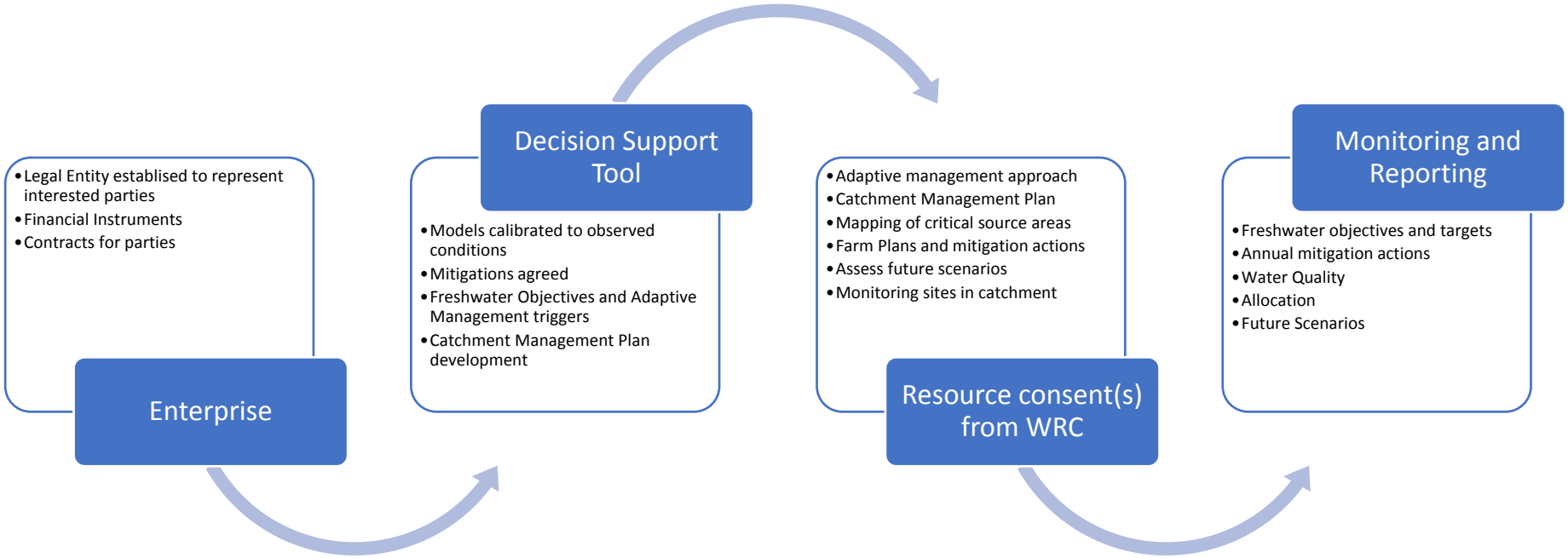
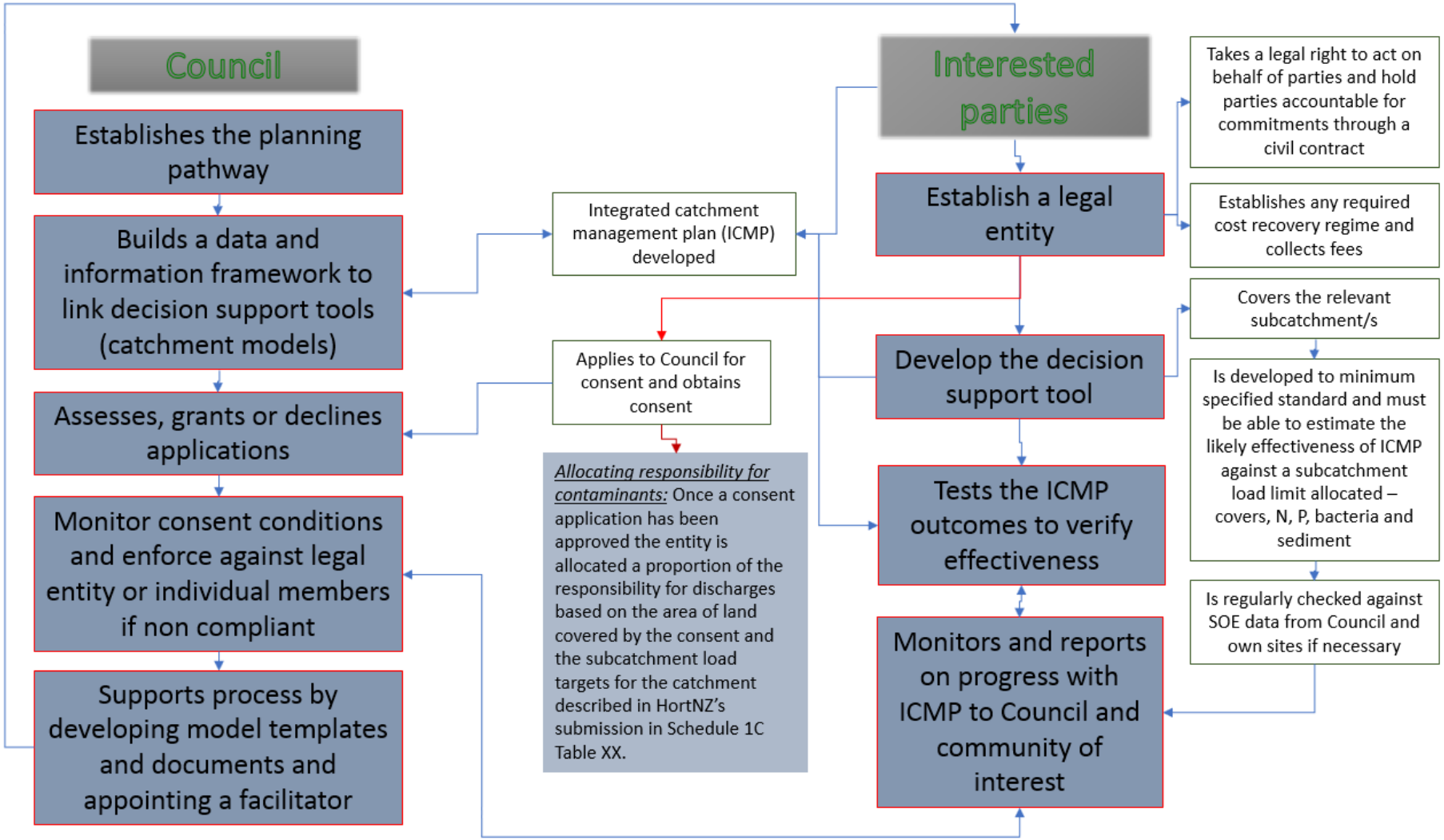


Diagram showing the relationship with Waikato Regional Council for Catchment Collective approach



APPENDIX D EIC CHRIS KEENAN BLOCK 3 HEARINGS PC1 9 July 2019

Modelled nitrogen losses for kiwifruit in the Waikato

Prepared by Zespri International Ltd – 10 June 2019

Regional Councils throughout New Zealand are responding to the National Policy Statement for Freshwater Management and as result there is a need to understand the impact of different land uses on water quality. In recent years various nitrogen loss values for kiwifruit orchards have been used by Regional Councils for modelling and limit setting purposes. These values have generally been derived from modelling and have the caveat that they are based on very limited data on measured outputs. In 2016, Zespri recognised a need to measure nutrient losses and to improve the modelling of this. A study was therefore commissioned with Plant and Food Research (PFR) to measure and model N losses which has just reached its third year of data collection and is ongoing. The study includes 7 sites within the Bay of Plenty. Modelled N loss values, tested against real measurements, are now emerging from the study. The modelling is SPASMO based.

In May 2019, nitrogen loss values of 2 – 4 kg N/ha for kiwifruit orchards in the Waikato was provided for the proposed Waikato Regional Plan Change 1. These values were taken from a paper by Benge and Clothier (2016)[1] which brought together all the published information on nutrient losses from kiwifruit orchards at the time. The Waikato numbers originated from a published paper by Deurer et al (2011)[2]. It has recently been identified that those N loss values were theoretical and from a model that had not been calibrated using measured data for kiwifruit as none was available at the time. Furthermore, the main purpose of the paper was to quantify the water footprint of kiwifruit and not N losses.

For the Waikato, the latest modelling from the Zespri-PFR project described above in paragraph 1 shows long-term average N loss values of 10 - 20 kg N/Ha/Yr across a range of soil types, to a depth of 5m (Table 1). This modelling incorporated a range of soil types covering different drainage rates, the actual rainfall for the Waikato, and some assumptions for other variables (i.e. amount of N applied, and soil processes like mineralisation) that are based on current understanding of the inputs and outputs for nitrogen in kiwifruit systems. The modelling also incorporated water applied via irrigation which is common for the Waikato. Seasonal effects especially rainfall and soil drainage (soil type) are strong drivers of the model. In years of high rainfall, the losses will be higher and vice versa. The values here are long-term averages that allow for this.

Our understanding is that most of the kiwifruit orchards in the Waikato are on free-draining allophanic soils according to grower feedback and soil maps. Given this, we recommend a value towards the higher end of the values in Table 1 be used. Specifically, we propose that if a single value is required that an average value of 17.5 be used to allow for most orchards (i.e. 75%) being on free-draining soil but which also allows for orchards on poorer draining soils. Currently we do not have detailed soil types for every orchard in the Waikato to provide a more specific number.

The Zespri-PFR project is ongoing and over time is expected to deliver new information that will allow the model to be refined. This may result in modelled values that differ to those presented here, which is the best currently available for the Waikato.

In summary, new research shows that the numbers of 2 - 4 originally provided for the proposed Waikato Regional Plan Change 1 are a significant underestimate of N losses from kiwifruit orchards in the Waikato. A revised average value of 17.5 is recommended however it is important to note that these numbers may change as the modelling is refined over the coming years.

[1] Benge, J and B. Clothier (2016). Freshwater quality and eco-verification of kiwifruit orchard practices. http://www.hortnz.co.nz/assets/Natural-Resources-Documents/Freshwater-quality-and-eco-verification-of-kiwifruit-FINAL.pdf

[2] Deurer, M., Green, S. R., Clothier, B. E. & Mowat, A. Can product water footprints indicate the hydrological impact of primary production? - A case study of New Zealand kiwifruit. J. Hydrol. 408, 246–256 (2011).

Table 1. Modelled N losses (kg N/Ha/Yr) for soils in the Waikato to a depth of 5m.

	Poor-draining →				**Well-draining**
	Te Kowhai silt loam	Waihou gritty silt loam	Te Rapa peaty silt loam	Hamilton clay loam	Horotiu silt loam
Long term average (2005-2018)	10	10	14	14	20