

HBRC's Closing statement 22 June 2021

General introduction – Ceri Edmonds

1. Before I pass this segment over to the reporting officers, I would like to take this opportunity to thank everyone again who has been involved in the development of the Proposed Plan Change 9 and to all who have been involved in the hearings these past weeks. I would like to acknowledge and recognise the significant time, effort and dedication they have afforded to the process. Over the last three weeks of hearings we have heard from all sectors of our community and as I said in my opening, the level of engagement we have had in this process indicates how important the issues surrounding freshwater are, for the TANK catchments, the region and Aotearoa.
2. We were very fortunate to have our first week of hearings held at Mangaroa marae and again I would like to thank Cordry and his whanau for their manaakitanga. Our second week was held at Toitoti in Hastings and I would like to give thanks to Marei Apatu for opening and closing our proceedings and keeping us safe through his strong karakia, and in this final week I would like to thank Chad Tareha for opening the proceedings and for closing the hearing later today at the poroporoaki.
3. During the three weeks we have had numerous submitters explain to us what Proposed Plan Change 9 means to them, their wai, their land, their culture and their economy. I think there has been sound agreement that water is critical to all and is our sustaining life force. It is therefore a very important decision that our independent hearing panel have to make for the future freshwater management for these four catchments, and I am grateful for their substantial efforts in understanding this plan. Nga mihi

Collaborative Process – Ceri Edmonds

4. As noted in my opening statement the TANK collaborative process commenced in 2012, and at that time was considered to be a bold and innovative approach to plan development. 30 plus people representing various sectors of the community took part in 42 meetings over six years. The TANK Group was made up of mana whenua, environmental organisations, territorial local authorities, DoC, the DHB and primary sector representatives. Most members of the Group remained for the duration of the process.
5. The terms of reference for the Group made clear from the outset that the members were '...selected to reflect the broad interests in water management and to provide a cross-section of values, understanding and perspectives'. Members of the Group were in the main, nominated by their sector or group to be their mandated representative, and where they did not have the mandate they participated as individuals. The expectation was for all of the members of the TANK Group to convey ideas and perspectives from their wider networks, and equally to feed back the information from the Group to their networks.
6. During those six years the Group took the time to immerse themselves in the issues relating to land and freshwater, share values and gain an understanding of the science that was presented to them. The collaborative process was highly participatory and iterative over this period. The aim of the Group was to provide the Council via the Regional Planning Committee with consensus recommendations regarding objectives, policies and rules. Where consensus could not be reached it was intended that the decision making would fall to the Regional Planning Committee. As new information, ideas and science came to the fore the plan evolved. The plan was very much a community plan, rather than just being the Council's plan. Much of the plan has come about as a consequence of testing ideas and solutions within the TANK Group.

7. At the conclusion of the TANK collaborative process the plan was handed over to the Regional Planning Committee in August 2018. The Regional Planning Committee were tasked with making final decisions in particular on those issues where consensus had not been reached (high flow allocation limits, flow enhancement of lowland streams, minimum flows and allocation limits for Ngaruroro and Tūtaekurī rivers. Some issues were not completed by the TANK Group, including protection of source water for community supply, stormwater discharge and land use change provisions). The ownership of the plan and decision making was in essence passed from the TANK Group and the community they represented to the members of the RPC.
8. It should be noted that the RPC is the first co-governance committee in New Zealand which is supported by legislation – The Hawkes Bay Regional Planning Committee Act 2015. The role of the RPC is to oversee the review and development of the Regional Policy Statement and regional plans for the Hawke's Bay region, as required under the Resource Management Act 1991. With an equal number of Regional Councillors and Post Settlement Governance Entity (PSGE) representatives, this committee is the co-governance group for the management of natural resources in Hawke's Bay. The establishment of the RPC midway through the TANK collaborative process did not come without its own challenges for mana whenua. This was a significant change in the landscape around representation and mandate.
9. As the RPC traversed the remaining issues it was highlighted that the collaborative process did not meet the expectations of all mana whenua. It is acknowledged that through the evolution of the plan development there have been significant pressures on mana whenua in terms of their ongoing time and commitment to remain in the process and for that I am grateful. Their input has been invaluable and has significantly altered the way the plan has been formed.
10. I would like to touch on another point regarding the Collaborative Process. During the past three weeks the panel has heard a range of views regarding the success or otherwise of this process and I was asked by the panel during my opening statement "If you were to do it again, would you do it differently", I stand by my answer that yes I would do things differently however that being said I would also like to reiterate my earlier comments that the collaborative process was invaluable for a number of reasons particularly the forming of relationships and it has enabled people of all sectors of our community to come together to share their values and ideas. So if I was asked did I think the collaborative process was a success my answer to that would be yes, however I acknowledge that as with all processes there should be lessons learned, both positive and negative, and these lessons should influence how we do things in the future - "Titiro whakamuri, kia haere whakamua. Reflect on where you have come from to enable the path ahead".
11. We acknowledge the drafting amendments requested by NKII and have considered the amendments being sought. We acknowledge that for mana whenua the Māori voice may not be appear as dominant in the proposed plan as they have wanted, but the voice of mana whenua was heard strongly in the development of PPC9, the new limits and objectives for freshwater and its management that were a key part of the iwi message. This is evidenced by the general acknowledgement by submitters and stakeholder groups that a change to the way land and water is managed is necessary and the support for the outcomes for improved water quality and need for limits on resource use.

Kotahi – Ceri Edmonds

12. The final point I would like to clarify is with regards to Kotahi and how TANK fits into the development of this combined Regional Plan.

13. As noted within my statement of reply evidence the Regional Council is scheduled to undertake a review of the RPS, RRMP and the Regional Coastal Environment Plan and has taken the decision to combine these broader plan review workstreams with the freshwater planning required under the NPSFM 2020. This has been part of a wider discussion with the RPC and Council in developing the Long Term Plan proposals for Kotahi, in particular regarding additional resourcing required to actively involve tāngata whenua in plan development.
14. The Regional Council are required by the NPSFM to notify the freshwater plan by 31 December 2024. I acknowledge there have been a number of queries regarding the alignment of PPC9 with the NPSFM 2020, and in particular where PPC9 is not giving effect to the NPS when this alignment will take place. It is proposed to revisit those areas of the plan which have not given effect the NPSFM 2020 by December 2024. This review of the TANK catchments will form part of the development of Kotahi.
15. This regional approach will enable the council to develop the visions and values for all of the catchments in partnership with tāngata whenua and give effect to Te Mana o te Wai.

** introduce Matt Conway*

General comments – Anne Bradbury

16. The Reporting Team will be responding to key themes we heard throughout the hearing. We have heard from a variety of submitters over the course of the three weeks but there are some key themes that have come through that we wish to discuss.
17. We heard yesterday (Grey Wilson from Ngati Kahununu Iwi Incorporated) that we did not respond to all evidence in our Addendum Report and Mr Drury from NCC stated that in his summary we read earlier. I want to reassure submitters that the Reporting Team considered all the evidence we received. The approach we took was that if our position in the original section 42A Hearing Report did not change, we did not make a further comment in the Addendum Report about the evidence. Both the original section 42A Hearing Report and the Addendum Report are the Reporting Team's comprehensive view on the submissions and the evidence received from the submitters.
18. NKII provided more detail in their package of evidence but their position on key issues has not changed from their position in the original submission. The analysis in the original section 42A Hearing Report is still relevant as it analyses the issues.
19. With regard to water quality, there was relatively wide agreement on the water quality outcomes being sought across all the submissions, and wide acceptance that some water quality attribute states would take longer to understand fully and be met. However, NKII was seeking substantive change to the methods used to ensure objectives could be met. Submissions by NKII were seeking a more regulatory approach to land use in order to meet objectives and these were assessed as part of the s42 Hearing Report.
20. With regard to the water quantity provisions, I understand that NKII is opposed to the water management regime that the Reporting Team supports, in particular the reliance on mitigation measures, the Actual and Reasonable re-allocation and the 90 million cubic metre interim limit. NKII's evidence did not include substantively different reasons from their original submission, therefore we consider our analysis in the section 42A Hearing Report responds to these issues.

PPC9 vs RRMP – Anne Bradbury

21. In week one and yesterday, the 21st June, we heard from submitters who sought that the plan change was amended significantly or that the plan change was refused. In weeks 2 and part of this third week of the hearing we heard a contrasting view from submitters that generally supported PPC9 however they were seeking a few key amendments.
22. Some submitters have stated that they think that PPC9 is the status quo. The Reporting Team and I believe that PPC9 is a new approach to managing land and water resources. PPC9 responds to resource management issues in the catchments with regards to water quality and the over allocated aquifer. PPC9 will have immediate impact both in terms of how people value water in a limit situation where there is no more easy water and new abstraction is severely constrained. I would like to discuss how PPC9 provides more than the Regional Resource Management Plan as the RRMP is what I consider to be the status quo. Mr Black from Te Taiwhenua o Heretaunga referred to the RRMP and the deletion of various parts of the RRMP. The RRMP provisions have been replaced by provisions that are more targeted to the TANK Catchments and they provide a higher level of protection than the RRMP.
23. Water quantity provisions in PPC9 have been developed on the basis that some water quantity areas in the TANK catchment are over-allocated and that groundwater takes have stream depleting effects. The RRMP does not contain the necessary tools to effectively and efficiently address the water quantity challenges of this catchment. Under the RRMP, all water takes are permitted or assessed as a Discretionary activity. The RRMP policies provide little or no guidance about reducing consented volumes, or mitigating cumulative adverse effects which cannot reasonably be avoided. PPC9 replaces those provisions with objectives, policies and rules which are more targeted and certain. PPC9 sends a clear directive to decision-makers and applicants that enabling over-allocation to continue or be exacerbated is unacceptable through, for example, the introduction of a prohibited activity status, reducing consented allocations according to Actual and Reasonable use, and reducing the volume of new permitted water takes.
24. With regards to water quality, PPC9 includes a number of provisions targeted at improving water quality that are not reflected in the RRMP. New requirements for Freshwater Farm Plans will result in identification of (diffuse) contaminant loss risk at a property scale and mitigation measures necessary to meet local water quality objectives. This work is directed by a priority catchment management approach targeting risk area and poor water quality areas as a priority. Action to manage diffuse contamination will not progress without PPC9.
25. PPC9 further establishes baseline and target water quality at a level of detail not provided in the RRMP. The transparency and clarity provided by Schedule 26 about existing and desired water quality enables better decision making about resource use, including in relation to managing discharge activities as well as diffuse contamination as a result of production land use.
26. New stormwater management provisions in PPC9 also removes some of the barriers to consistent and integrated management of stormwater discharges. This includes at a property scale and across urban areas. PPC9 addresses legacy issues as well as providing for improved future stormwater management by Napier, Hastings and the Regional Council. The RRMP contains rules that prevent this integrated management and new PPC9 policy and rules raise the required levels of performance in respect of stormwater discharge quality management and managing risk of contamination from high risk sites in urban areas.
27. While the RRMP seeks that there is no degradation of water quality, especially groundwater quality, the PPC9 objectives, policies and rules as well as the detail of

Schedule 26 all seek an improved level of resource management so that not only is water quality maintained, it is also improved to meet the specified attribute states. PPC9 appropriately raises the expectation for improved management required at a property scale and through implementation of PPC9 by the Regional Council and other stakeholder agencies.

28. We are preparing a table to answer Dr Cowie's request yesterday about the RRMP provisions, the equivalent PPC9 provisions and the key differences. We can send it to you tomorrow or Friday as we were not able to finish it in time for our session today but I have generally described it above.

Freshwater Management Units (FMUs) – Anne Bradbury

29. Ms Edmonds spoke yesterday about the Regional Planning Committee determining FMUs for the region at the next Regional Planning Committee. There is a process to go through and I believe the Regional Planning Committee is the best place to determine FMUs for the region. I note that in the definition of FMUs in the NPSFM2020 it states that the regional council determines FMUs in accordance with clause 3.8 of the NPSFM. Clause 3.8 (1) of the NPS states that the regional council must identify FMUs for its region. I take that to mean that the regional council must identify FMUs and in the Hawke's Bay region, there is a clear role for the Regional Planning Committee in determining FMUs. I do not think FMUs should be determined by planning expert caucusing which was suggested by a submitter that appeared yesterday. I do note that 3.8(5)(b) states that monitoring sites relating to Māori freshwater values must be determined in collaboration with tangata whenua, so once an FMU is determined the council must work with tangata whenua to determine these monitoring sites.
30. Despite PPC9 not including FMUs, it seeks to manage freshwater at an appropriate scale for the freshwater bodies in the plan change area through water quantity and water quality areas. These areas allow the Council to manage connected groundwater and surface water bodies.

Allocation and stream depletion effects – Ellen Robotham

31. Yesterday the Chair asked whether setting an annual allocation through an Actual and Reasonable approach will create 'headroom' for irrigators to increase their use. I understand the concern to be that what was a users' maximum use could become their average use.
32. I do not consider this is likely because there is no incentive for irrigators to pump water when there is no need. We have heard from various submitters that running irrigation is costly, and can be detrimental to production if excessive or applied unnecessarily. I also think it would be irresponsible for irrigators to intensify or maximise production in 'normal' climate years up to their annual allocation because in a dry year, they would have insufficient water to maintain their crops and they would perish.
33. The interim limit has been set at 90 million cubic metres based on the estimated maximum use of the 2012/2013 water year. As demonstrated in the evidence of Dr Kozyniak, 2012/2013 is one of the years that is considered an 95th percentile climate event and we have used as proxy for estimating the demand required to meet a 95% security of supply.
34. While I acknowledge that stream depletion effects are occurring at existing levels of water use, reducing allocation limits is not considered an effective method of restoring lowland stream flows. Mr Rakowski has submitted further evidence on this and is available on zoom to discuss this further.

**Mr Rakowski discusses the modelling*

35. In relation to the Paritua and Karewarewa streams in particular, PPC9 recognises that this is a complex problem which does not have a clear cut solution. I do not consider the setting of a minimum flow and the enforcement of surface water cease-takes at minimum flows will be effective or efficient methods of responding to this issue because stream depletion is a result of the cumulative effects of pumping across the Heretaunga Plains as described in the additional information provided to you by Mr Rakowski on 4 June. The evidence submitted by Mr Rakowski today identifies that reducing the groundwater allocation to 70 Mm³/yr would not restore flows in the Karewarewa Stream to the desired trigger level during average summer periods, and certainly not during very dry summers.
36. POL TANK 44 reflects the complex nature of this issue by requiring further investigation, improvements to groundwater models in the Paritua area, and suggesting potential mitigation options such as riparian management, wetland creation and provision of flows from the Ngaruroro. Submitters during Week 1 indicated that mana whenua also have storage ideas and aspirations they would like to investigate near their marae. I consider an appropriate change to POL TANK 44(d) would be to include consideration of storage options.

Telemetered data and minimum flows - Ellen Robotham

37. In Week 2, we heard from submitters that the Tūtaekurī minimum flow should not be raised because there was a historic instance of a ban being imposed on surface water and connected groundwater takes. As demonstrated by the memo provided by Mr Waldron, it is more appropriate to use models to understand and test the implications of setting or altering minimum flows, rather than historic telemetered data. Mr Waldron is unable to be here this afternoon so he has prepared the memo which discusses this.
38. I continue to support the Tūtaekurī minimum flow being set at 2500 litres per second based on modelling.

Stock drinking water – Ellen Robotham

39. Under RRMP Rules 53 and 54, permitted takes for stock drinking water uses are not limited by a quantity. Rules TANK 7 and 8 as recommended by the s42A Addendum Report would enable existing takes for stock drinking water to continue unlimited, while only restricting new takes and uses. Having sought advice from HBRC consent planners, it is considered that identifying a “new” stock water take and use would be reliant on identifying whether the *use* was new, as opposed to whether the *take* is technically new. In relation to this, I note an error in the rule cascade provided as part of the ‘shopping list’ response on 11 June 2021. The rule cascade should have more accurately referred to takes and uses, instead of only takes.
40. For example, if a farmer were to begin a water take to supply their stock which previously had direct access to a stream, that would not be considered a new use and would remain a permitted activity which existed as at 2 May 2020 and would not be subject to a limited volume. I do note however that Rule TANK 7 (relating to surface water takes) is more stringent than Rule 54 because stock takes were excluded from Rule 54 entirely, whereas Rule TANK 7 subjects stock water takes to other conditions (for example, ensuring fish are not caught in the take infrastructure).
41. As discussed in the memo provided to you by Dr Smith on 10 June, stock drinking water is thought to account for less than 1% of the annual average total use. As expressed by

submitters in Week 2 of the Hearing (for example, Mr Galloway of Federated Farmers), stock numbers in the TANK catchment are decreasing and not expected to increase, therefore water demand for stock drinking water is not expected to increase. Despite that, I consider it useful to retain a limit on new stock water drinking uses so that we can gain a better understanding of water demand, and reflect supply constraints.

Water allocation for rootstock survival – Ellen Robotham

42. Several submitters have suggested a specific allocation of water to enable the survival of horticultural tree crops during periods where they would otherwise be subject to a ban. No submitters have provided specific information about the quantity of water that is required to enable the survival of rootstock compared to the quantity required to produce fruit, however, Ms Sands of Horticulture NZ indicated that, depending on scale, 20 cubic metres per day for existing uses is likely to be sufficient.
43. The intent of the permitted rule in TANK 7(b)(i) and 8(b)(i) is to enable permitted activities existing at 2 May 2020 to continue taking up to 20 cubic metres per day. If a take and use for rootstock happened to be a permitted activity under the RRMP rule 53 or 54, then it would continue to be permitted here. For clarity, I don't assume that this would apply to all rootstock takes and uses.
44. Some submitters have suggested that PPC9 adopt a similar approach to providing for rootstock survival as the Tukituki Chapter in the RRMP. I do not consider this appropriate because the whole water management regime for the Tukituki catchment is quite different to what is proposed for the TANK catchment. The different regimes reflect the different understanding and contexts of hydrological connectedness, over-allocation and stream depletion effects. Policy TT9, which is the policy in the Tukituki chapter of the RRMP, enables takes for the survival of rootstock to be provided for as a consent condition. Takes are to be limited by a cumulative rate of take across all surface water allocation zones of 200 litres per second, to the five days after a minimum flow cessation take restriction is imposed, and where no practicable alternative sources of water are available or accessible.
45. As far as I am aware, we do not have the information to know what an appropriate rate of take limit is across TANK catchments, or how many days are appropriate to enable takes to continue after a ban is imposed to replicate Policy TT9 in a way which is appropriate for the TANK hydrological context.
46. POL TANK 51 does provides for water essential for the survival of horticultural tree crops within the priority order specified for drought events where Council makes directions under section 329 of the RMA. This provision is not replicated in the Tukituki chapter of the RRMP.

Circular definition of Actual and Reasonable – Ellen Robotham

47. Dr Cowie asked a question during Week 2 of the hearing about whether the definition of Actual and Reasonable was unnecessarily circular. I consider that the qualifier in brackets provides clear guidance to decision makers. If there is insufficient or inaccurate water meter data, the applicant still qualifies to have their application considered according to a or c.

Sufficient or accurate water meter data – Ellen Robotham

48. Submissions from Hort NZ¹ sought clarity in relation to the concept of sufficient or adequate data in relation to assessing Actual and Reasonable use. The Actual and Reasonable definition allows for situations where there is 'insufficient or no accurate water meter data' when considering existing water demand - and while there is no separate meaning for this, Matters for Discretion (1) (Rules TANK 9 and 10) provide discretion to consider Actual and Reasonable in light of:
- a) The completeness of the water meter record
 - b) The climate record and whether there were any water use restrictions or bans
 - c) Effects of water sharing
 - d) Crop rotation/development phases.
49. This provides a decision-maker discretion to assess the adequacy of the water meter record to assess actual water need on a case by case basis and enables the range of situations where water meter data is not available to be taken into account.
50. A definition for this concept could be added to the TANK glossary so that it applies as a general principle, not just in relation to a discretionary matter for a specific application. In that case a glossary term could be worded as follows:

Insufficient or no accurate water meter data in relation to Actual and Reasonable water use means:

- where there is no or incomplete water use data for an irrigation season or, for other water uses, a water year, within the ten year period up to 2020 that would otherwise be the year reflecting their maximum annual amount.
 - where there is no or incomplete seasonal water use recorded as a result of water use restrictions or bans being imposed by HBRC or as a result of consent conditions.
51. The situation where potentially useful water meter data is disregarded as a result of the whole data set being considered 'insufficient' should be avoided, so we further recommend that it may be helpful to add to the end of clause (c) of the meaning for Actual and Reasonable use the following:
- c) for irrigation takes, the quantity required to meet the modelled crop water demand for the irrigated area with an efficiency of application of no less than 80% as specified by the IRRICALC water demand model (if it is available for the crop and otherwise with an equivalent method), and to a 95% reliability of supply where the irrigated area is;
- (i) no more than in the permit due for renewal, or any lesser amount applied for, and in the case of Heretaunga Plains Water Management Unit, is not more than the amount irrigated in the ten years preceding 1 August 2017 and
 - (ii) evidence is supplied to demonstrate that the area has, and can continue to be, irrigated and the permit substantially given effect to

In applying the Irricalc model, the Council will take into account any water meter data that is applicable.

52. Another approach could be to compare what water data is available to the water use data for adjacent similar type uses, to see if what is proposed is equitable.

Actual and Reasonable Use and Recognition of Existing Investment – Ellen Robotham

53. A large number of submitters have raised concerns about the impact of re-allocation according to Actual and Reasonable use on existing investment. The following examples

¹ Hort NZ Holmes Evidence 21 July para 27

were provided by submitters to show why water demand might increase to meet the needs of existing investment and where the new approach to Actual and Reasonable water use allocation would impact on:

- New crop testing and development (chestnuts) prior to full establishment of a productive crop
- Purchase of land (with associated water permits) with the objective of developing grape crop over several years
- Planned expansion of land holdings to increase area of production
- Investment into significant winery infrastructure that was dependant on increasing areas of planted grape crop
- Intensification of production from tree and grape crops as a result of new technology and growing systems that result in increased productivity per hectare.
- Development of significant infrastructure staged over several years with water use planned to increase over time
- Consolidation of activities across multiple sites to one site.

54. I consider there is a tension between PPC9 provisions for a sinking lid approach to groundwater abstraction and the requirement under sections 104(2)(b)(vi) and 104(2A) of the RMA to have regard to existing investment and planning provisions in the context of consent applications.

55. As notified, PPC9 did enable very limited consideration of existing investment through Rule 9 matters for discretion, however I consider this consideration is not sufficiently supported by PPC9 policies. As a result, only takes for municipal, community or papakāinga water supply could have their existing investment considered.

56. I will briefly set out the key provisions which are in conflict, explain the intention of Rule TANK 9 and suggest some options to address this conflict.

57. The particular policies, as notified, which require strict enforcement of the sinking lid are:

POL TANK 36(f)

avoiding further adverse effects by not allowing new water use

POL 37(d)(ii)

apply an assessment of actual and reasonable use that reflects land use and water use authorised in the ten years up to August 2017 (except as provided by POL TANK 50);

POL TANK 38

... restrict the re-allocation of water to holders of permits to take and use water... issued before 2 May 2020...

POL TANK 52(a)

Preventing any new allocation of water (not including any reallocation in respect of permits issued before 2 May 2020)

The definition of Actual and Reasonable

a) no more than the quantity specified on the permit due for renewal or any lesser amount applied for;

and the least of either;

b) the maximum annual amount as measured by accurate water meter data in the ten years preceding 1 August 2017 for groundwater takes in the Heretaunga Plains Water

Management Unit or in the preceding ten years preceding the 2 May 2020 as applicable elsewhere if accurate water meter data is available. (If insufficient or no accurate data is available either clause a) or c) will apply)

or

c) for irrigation takes, the quantity required to meet the modelled crop water demand for the irrigated area with an efficiency of application of no less than 80% as specified by the IRRICALC water demand model (if it is available for the crop and otherwise with an equivalent method), and to a 95% reliability of supply where the irrigated area is;

(i) no more than in the permit due for renewal, or any lesser amount applied for, and in the case of Heretaunga Plains Water Management Unit, is not more than the amount irrigated in the ten years preceding 1 August 2017 and

(ii) evidence is supplied to demonstrate that the area has, and can continue to be, irrigated and the permit substantially given effect to

Rule TANK 9, Conditions/Standards/Terms c)

The quantity taken and used for irrigation is the Actual and Reasonable amount

Rule TANK 9, Matters for Control/Discretion 2.

The extent to which the application was subject to programmed or staged completion of authorised major infrastructure developments over time.

58. While the allocation regime was intended to be restrictive, the discretionary matter was included in Rule TANK 9 to provide some consideration of increased water use for existing investment, within the amount originally authorised. This provision was intended to reflect the RMA provisions that allowed for consideration of existing investment in relation to re-application of resource consents under RMA section 124². A number of submitters also noted the RMA s104(2A) provision that requires the Council to “have regard to the value of the investment of the existing consent holder”. This in addition to the s104(1)(b)(vi) requirement to have regard to any relevant provisions of a plan or proposed plan.
59. Because of condition (c) of the rule which limits irrigators to their Actual and Reasonable use, it can only apply to takes provided for in condition (d) (i.e., municipal, community and papakāinga takes).
60. I consider more guidance is necessary for decision making in relation to how existing investment, and the associated water use can be accounted for. However, any allowance for existing investment that increases water use potentially reduces the ability of Council to avoid and phase-out over-allocation, and increases future costs if reducing the allocation limit is required as a result of implementing Policy 42.
61. Case law has not been particularly helpful in providing a consistent understanding of what ‘existing investment’ might mean. However, several options could be considered to provide water for existing but as yet unrealised water use including;
1. Exception within the condition,
 2. Amendment to the meaning for Actual and Reasonable use,
- or
3. Consideration of increased historical use above that provided for by the meaning of Actual and Reasonable use as a restricted discretionary activity in Rule TANK 11. This would need to be supported by additional policy direction.
62. The following recommendation is based on option 3. I consider that applications for increased water use above the levels described by Actual and Reasonable use should be considered as discretionary activities rather than as part of the restricted discretionary

² HDC evidence, 21 June, para 18 page 4.

Rules TANK 9 and 10. This is because of the concerns about the adverse effects of existing water abstraction, particularly groundwater use and impacts on connected surface flows. This adverse effect as well as the significant (paper) allocation require a rigorous assessment of existing investment. Both options 1 and 2 could enable allocation above Actual and Reasonable as a Restricted Discretionary activity.

63. Changes I recommend in the Section 42A Hearing Report go some way to supporting Option 3 by more clearly distinguishing between new allocations and re-allocation. For example, changes to the wording of POL TANK 36(f) and 37(d)(ii) restrict the granting of new consents, rather than restricting new land and water uses.

POL TANK 36(f)

avoiding further adverse effects by ~~not allowing new water use~~ granting new consents to take and use groundwater

POL 37(d)(ii)

apply an assessment of Actual and Reasonable use ~~that reflects land use and water use authorised in the ten years up to August 2017~~ (except as provided by POL TANK 50);

Underline and strikethrough replicate s42A and Addendum recommendations

64. To fully support Option 3, further amendments to POL TANK 37(d)(ii), POL TANK 52(b) and Rules TANK 9 Matters for Discretion is recommended. The intention of these additions is to narrow the scope of what uses are able to be considered and not 'open the doors' to every user who can demonstrate a desire to expand or intensify.

POL TANK 37(d)(ii)

Apply an assessment of Actual and Reasonable use ~~that reflects land use and water use authorised in the ten years up to August 2017~~ (except as provided by Policy POL TANK 50) and, take into account any water use required as part of a programmed or staged development specified within the existing water permit or associated resource consent, if:

1. the consent holder can demonstrate that existing investment is dependent on water use over and above Actual and Reasonable use; and
2. the specified activity or development has not lapsed during the resource consent duration; and
3. the activity or development is integral³ to the on-going operation of the activity or development for which the permit was issued; and
4. water demand is calculated for rootstock only where there is evidence of a contract for the supply of that rootstock existing as at 2 May 2020.

POL TANK 52(b)

for applications in respect of existing consents due for expiry or when reviewing consents, to;

- (i) allocate water according to ~~Actual and Reasonable use demonstrated actual and reasonable need~~ (except as provided by Policy POL TANK 50) and, take into account any water use required as part of a programmed or staged development specified within the existing water permit or associated resource consent, if;

1. the consent holder can demonstrate that existing investment is dependent on water use over and above Actual and Reasonable use; and

³ Integral means necessary to make a whole complete; essential or fundamental.

2. the specified activity or development has not lapsed during the resource consent duration; and
3. the activity or development is integral⁴ to the on-going operation of the activity or development for which the permit was issued; and
4. water demand is calculated for rootstock only where there is evidence of a contract for the supply of that rootstock existing as at 2 May 2020.

Rule TANK 9 is amended to delete **Matter 2**:

~~The extent to which the application was subject to programmed or staged completion of authorised major infrastructure developments over time~~

65. A change to Rule TANK 10 is not required because the same Matter for Control/Discretion was not replicated for Rule TANK 10.
66. A change to Rule TANK 11 is not required because a pathway is already provided for an application for the continuation of a previous permit which does not meet the conditions of Rule TANK 9 (i.e. one that is seeking more than the Actual and Reasonable amount).
67. A further amendment to the RRMP Chapter 7; Information Requirements is recommended to make it clear that a high bar is being set in relation to allowing for increasing water use in over-allocated TANK catchments including the Heretaunga Plains management unit.

Insert in section 7.7.1 and 7.7.2 of the RRMP as a consequential amendment:

Where an application is made in respect of water takes subject to Section 124 of the RMA in TANK quantity areas that are over-allocated, including in the Heretaunga Plains groundwater quantity area, information may be required to support increases in water use at rates or amounts greater than historic levels of water use as defined by Actual and Reasonable use, including but not limited to:

- the value of the existing investment that would be affected by capping water use to historic levels.
- evidence of programmed future development or staged growth that was dependent on access to increasing water use available within the applicable water permit due for renewal.
- the degree to which the water use complies with industry good practice in relation to the water use activity, including adoption of technology, production systems and efficient water use.
- the degree to which the amount of water specified on the applicable water permit was depended on in making investment decisions.

Municipal supplies – Ellen Robotham

68. I have provided information to the panel about how municipal supplies are affected by PPC9 quantity provisions as part of the 'shopping list' information provided on 11 June.
69. After listening to Hastings District Council and Napier City Council, I will address three aspects of the relief sought:
 - a. putting a 'cap' on the Councils allocations,
 - b. changing Rule 12 to a Non-Complying activity rather than a Prohibited activity,

⁴ Integral means necessary to make a whole complete; essential or fundamental.

- c. and providing for an increase in Councils water allocations as a Discretionary activity through Rule 11.
- 70. I recognise that PPC9 provides a stringent re-allocation regime and that this will constrain the ability of the councils to obtain greater quantities of water from these catchments in the future.
- 71. Counsel, in paragraph 15 of their submission this morning, stated that the Councils are not seeking free rein to unlimited water. Based on the Mr Clews submission, there is no sign of population growth in the Heretaunga Plains slowing. This also means that there is no sign of water demand in slowing. As Mr Chapman said this morning, urban domestic users have not previously seen a need to be efficient with their water use because they have had the perception that the resource is unlimited. I think it is appropriate to set a limit of Councils' allocations to send a clear message to all water users that there is in fact a limit to the groundwater resource.
- 72. As has been apparent from the range of submissions heard at the hearing, water is a valuable resource for many people and ecosystems across the TANK catchment. All of these people and ecosystems would enjoy more water to achieve their aspirations and thrive, and allowing any person additional water may in turn require another person to sacrifice their allocation.
- 73. I maintain my opinion that a prohibited rule status in Rule 12 is appropriate in the context of managing over-allocated water quantity areas. The risk of a non-complying activity is that it continues to enable the slow creep of individual takes with minor effects being considered on their own merits and being granted, continuing to exacerbate the impact of stream depletion on the Heretaunga Plains lowland streams.
- 74. As we have heard from Mr Rakowski, stream depletion effects are cumulative and the effect of municipal takes is not insignificant. Increases in the municipal allocation may have implications for the ability to address stream depletion effects.
- 75. While it is theoretically possible that water will become available within the interim limit, I consider the opposite is also possible. Continuing a slow, creeping increase will also increase the costs of implementing a limit under the NPSFM2020 s3.17 if the review under POL TANK 42 identifies a need to set a lower total allocation limit. By that I mean more users are likely to be subject to larger clawbacks. I consider it is more efficient at this stage to not allocate water, than it is to allocate water and claw it back at a later date. This can of course be reassessed through the Kotahi plan.
- 76. In relation to providing a Discretionary pathway through Rule 11 for increasing Council allocations, I consider that PPC9 provides pathways for the utilisation of other sources or methods, for example storage and augmentation, which the Regional Council is already investigating.
- 77. If the panel were to pursue this option, I do not consider the suggested POL TANK 37A is sufficiently restrictive. I do not agree that the matters listed a-c require sufficient consideration of potential and actual environmental effects, and I have found it hard to imagine a use that does not fall within those listed 1-4.
- 78. I suggest additional policy to support decision-making regarding increasing allocation for municipal supplies would be required which could include the following matters:
 - a. Whether the increase in allocation is absorbing previously permitted activities and the extent to which actual water use will increase (to account for, for

example the Bridge Pa situation where a community moved from individual bores to a town supply and the actual volume may not have changed but before it was not accounted for within a permit).

- b. Appropriateness of growth projections and reasonableness of timeframe (are they seeking a consent to meet demand of a low, medium or high projection and is that an appropriate projection)
- c. Demonstrated improvements in efficiency and extent to which demand can be met through further efficiency gains
- d. Demonstrated exhaustion of all other options and extent to which demand can be met by alternative sources (e.g. storage and augmentation)
- e. Stream depletion effects and measures proposed to mitigate those effects.

Land Use Change and Schedule 29 – Mary-Anne Baker

79. A large number of submitters pointed out potential issues arising in relation to the 'avoid' direction in Pol TANK 21 and the controlled activity provision of Rule TANK 5.
80. Submitters were also divided in their support between the notified version of Schedule 29 and the amended version following the section 42A report, although I note there was some support for the simplicity and clarity provided by the amended version.
81. The Section 42A addendum report further suggested a nitrogen loss threshold condition of no more than 10% nitrogen loss as a result of land use change.
82. I don't consider a controlled activity rule is precluded by the Pol TANK 21 clause (d) because while nitrogen loss can be modelled at a property scale, it is much harder to assess resulting impact on the levels of nitrogen in receiving water. Rule TANK 5 manages nitrogen loss at a property scale and depending on circumstances, enables mitigation measures potentially at a catchment scale. While Pol 21(d) sets a high bar, land use change resulting in nitrogen loss can still be considered provided water quality objectives can still be met in the receiving catchment.
83. While the revised Schedule 29 in combination with Rules TANK 5 and 6 would provide a threshold for oversight by the Council for land use change it is based on a high level assessment of risk of N loss. I acknowledge the concerns of submitters⁵ who favour a more robust evidence based approach, but the as notified approach was considered to be unnecessarily complex and costly and not well supported by a range of other submitters.
84. A number of on-going concerns have been expressed by a number of submitters including in relation to:
 - Impact on routine land use management and flexibility of land use
 - The complexity of the 'as notified' version of Schedule 29
 - The lack of robust risk nitrogen loss assessment and lack of robust evidence to support the Sec 42a version of Schedule 29
 - The uncertainty as to whether a landowner met the conditions of Rules TANK 5 and 6.
85. The concerns about the land use change rules have been wide ranging and persistent. I therefore provide the following amendments to the land use change provisions for consideration.
 1. Insert a new permitted activity rule that allows changes to production land use provided the area being changed is less than 20ha and that the change in Nitrogen loss as

⁵ Including Daveron EIC Para 39 for Heinz Watties (amongst others) and Ford at para 98-101 EIC for Hort NZ

modelled by Overseer or similar approved model is less than 10%. The permitted level of new intensive winter grazing is 10ha. Holding a FWFP is a condition of the permitted activity.

Land use change is to be defined as change to production land use activities that results in an increase of more than 10% nitrogen loss as modelled by Overseer or similar nitrogen loss budget.

I propose that this rule and Schedule 30 is supported by guidance information about what land use changes are more at risk of leading to higher N loss. This information would be based on that currently contained in the s42A addendum version of Schedule 29 (as amended in consultation with industry stakeholder organisations). In addressing compliance with this rule, the Council would not expect all land use changes to require an assessment of N loss change using Overseer if the risk of N loss was low.

2. Amend Rule TANK 5 (controlled activity) so that where Nitrogen loss is modelled to increase by more than 10%, a land use change may be up to 10% of a property, provided the landowner of the property is a member of a Catchment Collective. The 10ha limit on intensive winter grazing still applies.
 3. Amend Rule TANK 6 so that any activity not complying with the conditions of the new permitted rule or the controlled activity is a restricted discretionary activity.
 4. Delete Schedule 29
 5. Insert new provisions into Schedule 30 for FWFPs and Catchment Collective Freshwater Farm Plan and Industry programmes as follows:
 - Insert after section A2.3 the following new requirement:
 - i. The Plan must record any land use change that is more than 20ha per property and which is from a lower leaching level to a higher leaching level of nitrogen loss risk.
Information about leaching loss risk is provided in the leaching loss risk guideline available from the Council
 - ii. A nitrogen loss rate is calculated for a change from low to higher risk land use activities using Overseer or other model approved by the Council.
 - iii. For any land use change resulting in a Nitrogen loss rate of 10% or more, Rules TANK 5 or 6 will apply.
86. I recommend the trigger for requiring assessment of land use change to be increased to 20ha. This is in response to concerns about enabling routine land use changes within existing farming systems.
87. There may be an issue of scope, as this precise solution was not sought by any particular submitter. However, given the wide ranging concerns and opposing positions in relation to the usefulness of Schedule 29 (either version) I consider this solution may potentially be more acceptable and may benefit from caucusing.
88. If this solution is not acceptable to the Commissioners then, I would recommend amendments to Rule TANK 5 to clarify the intent to allow land use change at a property scale up to 10% of the property to be addressed by collective management and to clarify the relationship between conditions, so that any land use change

Schedule 30 – Mary-Anne Baker

89. Submissions from Hort NZ and Beef and Lamb seek further amendments to Schedule 30. Several provide for further clarity and are accepted as reasonable including in relation to specification of a conflict resolution process⁶, further reporting requirements for catchment collectives where outcomes not being achieved⁷.
90. Beef and Lamb submissions⁸ also suggest a new approval requirement in relation to Freshwater Farm Plans. I am concerned that this provision as written results in a reservation of a discretion to approve a permitted activity on the basis of a value judgement by the Council. I recommend that Section B 1.1 be amended instead to provide more direction as to the submission process for FWFPs (rather than an approval process).

Habitat Quality Index – Mary-Anne Baker

91. Forest and Bird provide information⁹ about an assessment tool for habitat quality. Habitat quality is relevant to the management of the compulsory value of ecosystem health as habitat is one of the five biophysical components that contribute to ecosystem health.
92. The attribute is particularly relevant to the morphology of the river and is impacted by activities and structures carried out in the bed of rivers. These activities are regulated under Section 13 of the RMA. By contrast, PPC9 is primarily concerned with RMA Section 14 and 15 and land use activities that impact on the quality or quantity of water within water bodies in relation to the setting of limits for resource use.
93. The likely 'home' for waterbody attributes related to morphology and river form and function such as the habitat quality Index described by Mr Kay is a schedule similar to Schedule 26. The Kotahi process is likely to identify management of activities in rivers, including gravel extraction and flood management and erosion control works as significant issues for communities and iwi. Objectives, policies and rules are likely to direct the extent to which habitat quality and river form and function are to be changed as a result of instream activities and structures.

Source Protection Zone maps – Mary-Anne Baker

94. Mr Rakowski would like to make a comment on the legal submissions from NCC and HDC and HDC.

** Introduce Mr Rakowski*

Hastings District Council Evidence – Mary-Anne Baker

1. I considered the evidence of Ms Sweeney in relation to Objective 9 and agree that reference to the management of risk to source water quality should be re-inserted.
2. Ms Sweeney also pointed out that given the introduction of the Source Protection Zones as Planning Maps Pol 7 required amending. I agree and a recommended amendment is shown below:

Pol TANK 7 When considering applications to take water for a Registered Drinking

⁶ Farelly Hort NZ Para 93, 96 EIC, Kessels for Beef and Lamb EIC at para 57

⁷ Beef and Lamb tracked changes version of schedule 30

⁸ ibid

⁹ Tom Kay Forest and Bird EIC

Water Supply, the Council will:

- a) ~~Require the determination of provide for the replacement or amendment~~ of a source protection extent or Source Protection Zone which reflects the level of protection required for that supply, according to a method specified in Schedule 35;
 - b) ~~Work with the applicant to prepare and notify a Plan Change to introduce or amend a Source Protection Zone Planning Map~~
 - c) ~~provide for the amendment of a Source Protection Zone where new information changes the outputs from the method specified in Schedule 35;~~
 - d) require applications to include an assessment of the Source Protection Zone or extent required, taking into account the factors set out in Schedule 35;
 - e) have regard to:
 - a. the extent to which the application reflects the factors and methodology in Schedule 35 when establishing the Source Protection Zone or extent; and
 - b. the impacts, including any costs and benefits, of any additional restrictions in the Source Protection Zone;
 - c. the level of consultation with land owners and occupiers^{203.9} in the Source Protection Zone.
3. I agree with Ms Sweeney that there was an unintended implication of requiring a district or city plan review by Policy 28(j) and Pol 31(c),¹⁰ and that they be amended as follows:

Pol TANK 28

(j) amending ~~district plans~~, standards, codes of practice and bylaws to specify design standards for stormwater reticulation and discharge facilities ~~through consent conditions~~, that will achieve the freshwater objectives set out in this plan;

k) when reviewing district or city plan to include provisions that specify design standards for stormwater reticulation and discharge facilities through consent conditions, that will achieve the freshwater objectives set out in this plan

POL TANK 31

To ~~assist in~~ achieve the ~~freshwater quality objectives 2040 target attribute states~~ in this ~~Plan~~ Schedule 26A ^{consequential}, HBRC, with the Napier City and Hastings District Councils will, no later than 1 January 2025, implement similar stormwater performance standards including through the adoption of:

- a) good practice engineering standards;
 - b) consistent ~~plan rules and~~ bylaws;
4. Referring to the other matters as directed by the commissioners:
- a. The insertion of reference to Primary flow paths in TANK Rule 21 was agreed as not being necessary

¹⁰ Sweeney HDC evidence 21 July

- b. The reference in TANK Rule 21 regarding the reference to wastewater, I agree that placing responsibility on the network manager for all domestic wastewater sources in stormwater (including from potentially failing on-site systems) and consequently not allowing controlled status for the network was unreasonable. However, the network operator should not be provided any opportunity for sewage discharges to be part of a stormwater network. To that end I agree that TANK 21 clause (vi) (not) Contain sewage, blackwater or greywater should be amended but recommend that it requires : (vi) (Not) Include any discharge from a wastewater network or wastewater source.

Stormwater provisions – Kim Anstey

95. I have considered the matters raised from the oral presentation from Mr Brown who appeared for the Oil Companies in relation to the stormwater provisions and I make the following recommendations.

Rule TANK 21 - Stormwater Network Consents, Controlled Activity

Condition a (iv)

96. I agree with Mr Brown that the ‘no hazardous substances’ condition is possibly an unrealistic scenario in the context of discharges at the network level. I did not agree with the solution proposed in the EIC of Mr Brown that this rule be deleted. However, the amendment proposed by Mr Brown in his oral evidence does have merit when considering that the balance of standards will enable consent conditions to be placed on network consents that will have the effect of reducing hazardous substances overtime, despite it not being a specific condition of consent. Therefore I support the recommended amendments Mr Brown provides in his oral evidence.

Rule TANK 19 - Stormwater Discharges, Permitted Activity

97. Mr Brown states that for the same reasons provided for Rule TANK 21, the ‘no hazardous substances’ condition should be deleted from TANK Rule 19. I differ here in that this is an entirely different rule and therefore should not be considered on the same basis. Rule TANK 19 creates the permitted standard and therefore designed to be stringent to ensure that only good quality stormwater is able to be discharged without a consent. I therefore do not recommend any changes to Rule TANK 19.

Rule TANK 22 - Stormwater from an Industrial and Trade Premise, Restricted Discretionary

98. The s42A Addendum Report supported the view that MfE compliant service station sites can be given a clear restricted discretionary pathway under this rule and amended condition (b) (iv) accordingly. Mr Brown’s oral evidence provided wording which differed from what was provided in his EIC. I believe that the amendments suggested in his oral evidence will make no material difference to what was proposed in the s42A Addendum Report as it is a matter of clarity. Service Station sites are still required to apply for an RD consent so further controls can be administered through consent conditions under the matters of discretion as required. Therefore, I agree that Mr Browns recommended changes to this condition be accepted.

MEMO

To: Anne Bradbury, Ellen Robotham, Mary-Anne Baker
From: Rob Waldron
Date: 18th June 2021
Subject: **THE USE OF FLOW DATA FOR DETERMINING ABSTRACTION RESTRICTIONS AND PREDICTING FUTURE RELIABILITY OF WATER SUPPLY**
File Ref:
CC: Jeff Smith

Telemetered and archived flow data

The Hawke's Bay Regional Council (HBRC) operates a telemetry system to manage a network of telemetered environmental monitoring sites that provide a near to real-time picture of the state of river and stream flows across the region. For rivers and streams with established minimum flow sites, abstraction restrictions are determined based on the best available assessment of flow at each site. Where available, telemetered rated river and stream flow data are used to provide an automatic assessment of flow. If telemetered data are not available, flow assessments are provided by manual flow gaugings or calculated flows, where the flow is estimated using a relationship to a nearby telemetered flow site.

Rated river flow datasets are time-series datasets that are derived from river water level data using a mathematical relationship known as a rating. The relationship can change over time due to the dynamic nature of rivers and streams. Ratings are continuously updated and maintained over time using calibration data obtained through manual flow gaugings.

To provide the most up-to-date and accurate telemetered rated flow data, the ratings used to derive telemetered rated flow from telemetered river level data, are reviewed and updated as soon as practicable when new calibration data becomes available. If it is determined that the current rating needs to be updated/changed, the new rating is applied. From the time the new rating is applied, all future flow data are derived using the new rating, until the rating is next reviewed.

Abstraction restrictions are assessed and notified daily using the best available assessment of flow. Flow assessments using telemetered rated flow data are based on a daily mean flow (calculated at 0630 NZST each day based on a 24-hour average starting at 0600 NZST the previous day).

Telemetered monitoring data are often referred to as raw or un-processed data. The HBRC endeavours to capture telemetered raw data to the highest possible quality by following robust established processes developed in accordance with the National Environmental Monitoring Standards (NEMS). However, all types of raw monitoring data can potentially contain errors from various sources (e.g. sensor drift, instrument damage or failure, human induced error, etc.), that may only be identified after the time of capture. All raw monitoring datasets captured by the HBRC are reviewed, processed and archived in accordance with the HBRC's quality assurance processes (ISO 9001-2015 certified), including river water level data and ratings for flow sites.

During the quality assurance process, river water level data can often be modified to improve or correct errors in the raw data, utilising additional information (e.g. from routine site inspections) that may not have been available at the time that the telemetered data were originally captured. Ratings are also reviewed as part of the quality assurance process and thus may be refined and updated. Quality assured archived river water level and flow data are considered to be of higher quality than the originally captured telemetered raw data (and may differ following the quality assurance processes undertaken). However, telemetered rated flow data are still considered the best near to real-time flow data available, particularly when used in flow assessments to determine the start or end of abstraction restrictions.

Predicting future reliability of water supply

A record of historical abstraction restrictions is maintained by the HBRC. This record is primarily used for compliance monitoring purposes. The record can be used to help identify the extent of restriction in previous years; however, it is not suitable for use in predicting potential future restriction or reliability of water supply under different flow management rules.

It is also not suitable to use historical river or stream flow data (telemetered raw data or quality assured archived data) to assess future reliability of supply under current or potential new flow management rules, due to the fact these data are already affected by past abstractions from surface water and groundwater.

Surface water and groundwater models are considered more appropriate tools for simulating water resources and management rules, and for predicting potential future reliability of water supply. The surface water and groundwater models that have been developed to model water resources in the Tūtaekurī River, Ngaruroro River, Karamū Stream and Heretaunga Plains Aquifer, were built and calibrated using quality assured archived monitoring data. The models were developed to incorporate the best available estimates of historical, current and potential future water use, to simulate the surface water and groundwater resources under natural conditions (removing the effects of past water abstractions) and under various scenarios with current and potential alternative future water management rules.

The development of the surface water and groundwater models is documented in the following reports:

- Rakowski, P. & Knowling, M. 2018. *Heretaunga Aquifer Groundwater Model – Development Report*, Resource Management Group, HBRC Publication No. 4997, Hawke's Bay Regional Council, Napier, New Zealand.
- Williamson, J. & Diack, E. 2018. *SOURCE Model Build Report*, Report Reference WWA0018/Rev. 5, Williamson Water Advisory Limited, Auckland, New Zealand.

The scenario modelling undertaken using these models is documented in the following reports (which include predicted changes to abstraction restrictions and potential impacts on reliability of supply for water abstractors):

- Rakowski, P. 2018. *Heretaunga Aquifer Groundwater Model – Scenarios Report*, Resource Management Group, HBRC Publication No. 5018, Hawke's Bay Regional Council, Napier, New Zealand.
- Waldron, R. 2018. *Surface water quantity scenario modelling in the Tūtaekurī, Ngaruroro and Karamū catchments. Greater Heretaunga and Ahuriri Plan Change (PC9)*, Resource Management Group Technical Report, HBRC Report No. 5013 – RM 18-28, Hawke's Bay Regional Council, Napier, New Zealand.