IN THE ENVIRONMENT COURT
AT AUCKLAND

I TE KŌTI TAIAO O AOTEAROA
KI TĀMAKI MAKAURAU

Decision [2026] NZEnvC 033

IN THE MATTER OF	appeals under Clause 14 of Schedule 1 of the Resource Management Act 1991 against the decision of the Waikato Regional Council on Proposed Plan Change 1 to the Waikato Regional Plan
BETWEEN	OJI FIBRE SOLUTIONS (NZ) LIMITED (ENV-2020-AKL-000083) FONTERRA CO-OPERATIVE GROUP LIMITED (ENV-2020-AKL-000084) WAIPĀ DISTRICT COUNCIL (ENV-2020-AKL-000085) TAUPO DISTRICT COUNCIL (ENV-2020-AKL-000086) HORTICULTURE NEW ZEALAND (ENV-2020-AKL-000087) IWI OF HAURAKI (ENV-2020-AKL-000088) WAIKATO RIVER AUTHORITY (ENV-2020-AKL-000090) HAMILTON CITY COUNCIL (ENV-2020-AKL-000091) SOUTH WAIKATO DISTRICT COUNCIL (ENV-2020-AKL-000092)

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED

(ENV-2020-AKL-000094)

DIRECTOR-GENERAL OF CONSERVATION

(ENV-2020-AKL-000096)

DAIRY NZ LIMITED

(ENV-2020-AKL-000097)

WAIRAKEI PASTORAL LIMITED

(ENV-2020-AKL-000098)

BEEF + LAMB NEW ZEALAND LIMITED

(ENV-2020-AKL-000099)

WAIKATO AND WAIPĀ RIVER IWI

(ENV-2020-AKL-000100)

AUCKLAND/WAIKATO AND EASTERN FISH AND GAME COUNCILS

(ENV-2020-AKL-000101)

FEDERATED FARMERS OF NEW ZEALAND

(ENV-2020-AKL-000102)

CNI IWI LAND MANAGEMENT LIMITED

(ENV-2020-AKL-000103)

LANDCORP FARMING LIMITED

(ENV-2020-AKL-000147)

PUKEKOHE VEGETABLE GROWERS ASSOCIATION

(ENV-2020-AKL-000148)

LOCHIEL FARMLANDS LIMITED

(ENV-2020-AKL-000149)

Appellants

AND WAIKATO REGIONAL COUNCIL

Respondent

Court:	Chief Environment Court Judge David Kirkpatrick Alternate Environment Judge Te Kani Williams Environment Commissioner Jim Hodges Environment Commissioner Mark Mabin
Hearing:	Hearing dates remain as set out in the first interim decision.
Last case event:	15 December 2025
Appearances:[1]	M Conway, T Fischer, and L Chai for Waikato Regional Council V Tumai and M Hooper for the Director-General of Conservation S Ongley for Auckland/Waikato and Eastern Fish and Game Councils P Anderson for the Royal Forest and Bird Protection Society of New Zealand Incorporated D Minhinnick and A Gilbert for Fonterra Co-operative Group Limited B Matheson and N Edwards for Federated Farmers of New Zealand C Thomsen and C Luisetti for Beef + Lamb New Zealand Ltd P Majurey for Iwi of Hauraki J Ferguson for CNI Iwi Land Management Limited and Waikato and Waipā River Iwi G Chappell for OJI Fibre Solutions (NZ) Limited T Mijatov, L Ford, and N Buxeda for Horticulture New Zealand and Pukekohe Vegetable Growers Association J Forrett and C Muggeridge for Lochiel Farmlands Limited B Carruthers for Wairakei Pastoral Limited G Pinnell for himself T Ryan and C Bulow for Waikato River Authority A Green and T Cassidy for Ōtorohanga District Council and Matamata Piako District Council C Malone for Waipā District Council N Garvan and R Te Rito for Genesis Energy Limited L Muldowney and S Thomas for Hamilton City Council, Taupō District Council and South Waikato District Council, Waikato District Council
Date of Decision:	27 February 2026
Date of Issue:	27 February 2026

[1] As for the main hearings.

SECOND INTERIM DECISION OF THE ENVIRONMENT COURT RELATING TO SECTION 70 OF THE RMA

A: We are satisfied that Permitted Activity Rules can be included in PC1 in accordance with current amended s 70 of the Resource Management Act.

B: We direct parties to identify any further evidence they consider needs to be provided, but we stress this should be limited to evidence that could potentially mean a different determination would or could result. We also direct parties to identify any matters of fact, expert opinion or law of direct relevance to our s 70 evaluation that they consider have been omitted or not been interpreted or referenced appropriately.

C: Costs are reserved.

Abbreviations

ANZECC 2000 guideline	These water quality guidelines were prepared in 2000 as part of Australia's National Water Quality Management Strategy (NWQMS) and relate to New Zealand's National Agenda for Sustainable Water Management. They provided governments and communities at the time with a set of tools for assessing and managing ambient water quality in natural and semi-natural water resources.
CFEP	Certified Farm Environment Planner
cfu	Colony-forming unit(s)
CSA	Critical Source Area
FEP	Farm Environment Plan
NBL	National Bottom Line
Primary contaminants	Total Nitrogen, Total Phosphorus, sediment and *E. coli*, as an indicator of microbial contaminants
RIS	Regulatory Impact Statement: Managing discharges under s 70 of the Resource Management Act
RERIMP	Regional Rivers Water Quality Monitoring Programme
S 70(3) effects	the effects in s 70(1)(d), (f) and (g) of the RMA
S 70(3) requirements	That the permitted activity standards, or those standards in combination with any other provisions in the plan, will contribute to a reduction of the effects in s 70(1)(d), (f) and (g) effects over a period of time not greater than 10 years
WRA	Waikato River Authority
WRC's Final Proposal	Final consolidated PC1 version 1 December 2025
WRC's 2022 SOE Report	*Te oranga o te taiao* |State of the Environment Report 2022

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Summary of findings

[1] We considered how to regulate our proceedings to best promote their timely and cost-effective resolution as required by s 269(1A). We were concerned that if further evidence had to be called and, particularly if a s 293 process was found to be necessary, it could be up to a year and possibly longer before PC1 could be fully operative.

[2] We did not consider it would be efficient or effective to require parties to produce further evidence relating to s 70 without providing clear directions on what we would require to undertake our evaluation. Having reviewed the evidence already before us with fresh eyes focusing on the requirements of s 70(3), we are satisfied that it is sufficient to enable us to make our determination without the need for further evidence. However, we direct parties to advise the Court if they have a different view.

[3] We are satisfied that the final provisions of PC1 are the most appropriate to meet its objectives. They were developed over a 10-year period with extensive community input. We are satisfied that they provide a soundly based and essential first step if Te Ture Whaimana is to be achieved in the longer term. We are satisfied that attempting to modify them further would not result in improved environmental outcomes and would more likely compromise them by delaying a start being made to giving effect to Te Ture Whaimana.

[4] Our primary findings are as follows:

(a) Section 70(3) effects are already occurring over large parts of the PC1 area.

(b) There is no practical basis on which to determine a specific quantum of reduction in effects that will result from the PC1 provisions, but we are satisfied that they will reduce the effects as a collective whole to the minimum extent practicable within the 10-year term of PC1.

(c) We are satisfied that it is appropriate that mitigations necessary to satisfy the provisions of PC1 and already implemented by farmers who have taken a proactive approach to reducing their effects should be recognised. The alternative of not recognising proactivity would be a disincentive that could and likely would affect future progress negatively.

(d) We are satisfied that the available science and the limitations of monitoring and predictive modelling options mean it is unlikely that any changes in s 70 effects will be detectable with any certainty within 10 years and more likely in excess of 20 years could be required.

(e) We are satisfied that there is limited potential for intensification of farming activities or expansion of CVP activities that will increase contaminants discharges and that any that is authorised will not compromise compliance with s 70(3).

(f) We are satisfied that some effects of the nitrogen load to come may continue to be observed to a decreasing extent for a few years after PC1 becomes operative in some parts of the PC1 area but may not start to appear in relation to the Upper Waikato FMU until beyond the term of PC1. These are not discharges that can be controlled by provisions in PC1, but may make confirmation of reductions achieved by the provisions more difficult.

(g) We are satisfied that the inclusion of permitted activity Rule 3.11.4.3 is the most efficient and effective way to achieve the objectives in accordance with s 32 of the RMA. We are satisfied that Permitted Activity Rules can be included in PC1 in accordance with current amended s 70 of the Resource Management Act.

(h) The only obvious alternative to the approach taken in PC1 would be to require all farmers diffusely discharging the primary contaminants

to apply for resources consents. The Council would then have to refuse to grant the applications in accordance with s107. The adverse social and economic effects would be serious.

(i) The Court has no jurisdiction to address s 107 matters in these proceedings.

[5] We considered carefully the decisions cited at [23] to [27] in Part A4 of this decision, starting with the Supreme Court's definition of "satisfy" in *Westfield (New Zealand) Limited v North Shore City Council,*[2]:

> [52] … (to do enough), and a standard meaning relevant in this context – to furnish with sufficient proof or information; to assure or set free from doubt or uncertainty; and to convince; or to solve a doubt, difficulty.

[6] We also considered the observations of the Court of Appeal in *Southland Regional Council v Southland Fish and Game Council* that:[3]

> [23] … Section 70 mandates an outcome and that outcome must be assured by the proposed rule before it is included in the regional plan. Plainly, whether that outcome is achieved by the rule, whatever its precise terms, is an evaluative matter upon which SRC must be satisfied, before the rule's inclusion. … Nothing in this judgment should be taken to presume that a particular form or type of evaluation is needed.

[7] And the observations of that Court in *Whakatane District Council v Bay of Plenty Regional Council:*[4]

> [74] … It will be for the public decision maker to demonstrate that proper consideration was given to the statutory requirement and that it carried out its statutory obligation on the basis of a sufficient foundation of information to satisfy itself of that threshold. …

[8] We also noted the following reservations expressed by Mander J in *The Environmental Law Initiative v Canterbury Regional Council:*[5]

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2 [2005] NZSC 17, at [52].
3 [2024] NZCA 499.
4 [2010] NZCA 346:
5 [2025] NZHC 4156.

> [110] I have considerable reservations whether, in any practical sense, the statutory test imposed by s 70 could realistically be applied to a proposed "region-wide" permitted activity rule for diffuse discharges, or reasonably be assessed with any degree of confidence given the variable states of freshwater bodies across the whole region at the time, the range of factors that applied to each, and the acknowledged uncertainties attaching to the available science. …

[9] We set out the context within which our determination must be made in Part B2, which includes a lack of key data to form the basis of any evaluation and the lack of methods to assess the effects of discharges on aquatic life from individual farms. Elsewhere through the decision we describe the scale, complexities and uncertainties associated with almost all material aspects of the case. In combination, this means that it is not possible to predict or verify what, if any, region-wide changes in effects on aquatic life will have occurred in 10 years and it is more likely that 20 years or more will be required before reliable conclusions will be able to be drawn. The same applies to conspicuous changes in colour and visual clarity and the rendering of fresh water unsuitable for consumption by farm animals. For these reasons, we share the reservations expressed by Mander J.

[10] While acknowledging these constraints, the question we have to answer is whether we are satisfied that the permitted activity standards in PC1 in combination with any other provisions in the plan, will contribute to a reduction in s 70(3) effects within 10 years. As set out in the decision, we took a bottom up, step-by-step and holistic evaluation of the evidence in considerable detail that reflects the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal in accordance with s 32, all of which are of considerable significance.

[11] Predicting the future 10 years ahead can only be based on the best currently available information and an expectation that the plan provisions will be implemented efficiently and effectively. We are satisfied that the information furnished as the basis for our decision is the best currently available after our thorough review and further consideration of the evidence. We must expect that WRC will implement the provisions in accordance with its functions, powers and duties under ss 30 and 84.

[12] Uncertainties will continue to exist into the future and there is no way that can be changed without first implementing PC1 and likely one or more further plan change and even then, there will still be uncertainties. However, based on the evidence, there can be no doubt that implementation of the PC1 provisions efficiently and effectively will reduce diffuse discharges of the primary contaminants within 10 years. Those reductions are already underway as result of mitigations implemented over the last 10 years. It is inconceivable in our view that there would be no reduction in s 70(3) effects within 10 years when there will have been significant reductions in discharges during and prior to that 10-year period. We are satisfied that a reduction in those effects will occur to the greatest extent practicable within 10 years by the implementation of the PC1 provisions, including permitted activity Rule 3.11.4.3.

PART A Background to the Second Interim Decision

A1 Background to the inclusion of Permitted Activity Rule 3.11.4.3 in Plan Change 1

[13] The Council Hearing Panel was satisfied that the permitted activity rules that it had recommended provided for farming at a scale that would "satisfy" section 70 of the RMA.[6]

A2 The emergence of s 70 as an issue

[14] Section 70 was not raised in appeals and the evidence presented did not address the extent to which conspicuous change in colour or visual clarity, the rendering of freshwater unsuitable for consumption by farm animals or significant adverse effects of aquatic life (**s 70(3) effects**) were occurring in the PC1 area. It was not raised as an issue until well into the appeals process and there was no scope to consider it prior to the issue of our Interim Decision.

[15] When issues emerged during the hearing about the potential significance of ss 70 and 107 for PC1, we considered it important that parties had the opportunity to comment before we issued our first interim decision.

[16] The Joint Farming Parties submitted:[7]

> [14] In our submission, if this Court is concerned about the application of s 70 to diffuse discharges, and whether it constrains the inclusion of permitted activity rules in PC1, then there would need to be a process by which the Council and the parties could call evidence to address the specific elements of s 70. In particular, the parties would need an opportunity to present their cases as to whether or not allowing the diffuse discharges associated with certain existing farming activities as a permitted activity would give rise to effects not authorised by s 70.
> …
> [15](a) Because s 70 applies at a much more granular level (i.e. receiving waters), there would need to be evidence about the impacts (both on the receiving waters or at a sub-catchment or tributary scale, together with evidence about "reasonable mixing".

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6 Hearing Panel Recommendation Report at [1640].
7 Memorandum dated 10 December 2024.

> [15](b) By way of further example, while there is some evidence of high sediment loads in parts of the Waipā river, there is insufficient evidence to determine the portion that is from natural sources compared with the portion that is from anthropogenic sources, and what impacts that sediment has on aquatic life. Accordingly, there is insufficient evidence to determine the specific parts of the Waipā FMU where significant effects on aquatic life are likely to arise, after reasonable mixing and as a result of the discharge of the contaminant.

[17] Other parties agreed that further evidence would be required if the Court had concerns about s 70 constraining the permitted activity rules in PC1, and reference was made to the possible need for another hearing and a s 293 process.[8] At the same time, the responding parties placed considerable emphasis on avoiding further delays to PC1 becoming operative pending any changes to s 70. They sought that an interim decision be issued, except in relation to s 70.

[18] We note that the discussions related to s 70 focussed on the effects in ss 70(1)(d), (f) and (g). There were no submissions or references in the evidence to the effects in ss 70(1)(c) and (e) - the production of conspicuous oil or grease films, or scums or foams and any emission of objectionable odour. However, we are satisfied that because Rule 3.11.4.3 relates only to diffuse discharges, which travel underground before emerging in surface waters, they will not give rise to either of the effects referred to in ss 70(1)(c) and (e).

A3 The Court's initial response

[19] By minute dated 13 March 2025, we indicated:

> [9] … we will not make any final determinations in relation to s 70 in our interim decision and no party has opposed this approach. However, because of the urgency to make progress on PC1, we will not remove from the interim decision our evaluation of permitted activity rules to date, which was largely completed before s 70 was raised as an issue. This will hopefully assist parties understand how the provisions may work "in the round", subject to any changes made to s 70 in the RMA.

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8 WRC, Fish and Game, HortNZ, Forest and Bird, WPL, Waikato and Waipā River Iwi.

[20] The Interim Decision was issued on 28 May 2025 and, in relation to s 70, stated:[9]

> (a) the available evidence does not enable us to determine if the effects on aquatic life in the receiving waters as a result of a permitted discharge, either by itself or in combination with the same, similar, or other contaminants, would or would not be significant in some parts of the PC1 catchment;
>
> …
>
> (c) even if there was scope, we anticipate it would take at least four months and possibly longer to obtain, hear and determine the issue; and …

A4 The Court's subsequent response to amended s 70

[21] The current amended version of s 70 of the RMA came into force on 21 August 2025. When it became clear that the Court would have to be satisfied that the permitted activity Rule 3.11.4.3 would comply with amended s 70(3) before it could be included in PC1, we considered how to regulate our proceedings to best promote their timely and cost-effective resolution as required by s 269(1A).

[22] We were concerned that if further evidence had to be called and, particularly if a s 293 process was found to be necessary, it could be up to a year and possibly longer before PC1 could be fully operative. We looked at ways in which that could be avoided if possible or at least shortened significantly.

[23] In *Westfield (New Zealand) Limited v North Shore City Council,*[10] the Supreme Court stated:

> [23] … The requirement that the consent authority be "satisfied" that adverse effects on the environment are minor is a pointer to additional conviction and the need for some caution.
>
> [24] …The statute requires a consent authority to be "satisfied" in cases where there is some departure from a general approach. Thus, powers to extend time limits for existing use rights, to depart from usual principles of natural justice or to permit contamination[21] are all decisions that require the consent authority to be

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9 *OJI Fibre Solutions (NZ) Limited v Waikato Regional Council* [2025] NZEnvC 170 (**Interim Decision**), at [202].

10 [2005] NZSC 17.

> "satisfied" that the course is appropriate in the circumstances or that the adverse effects will not eventuate or will be minor.
>
> …
>
> [52] … the double emphasis on "satisfied", the strongest decisional verb used in the Act, the etymology of "satisfy" (to do enough), and a standard meaning relevant in this context – to furnish with sufficient proof or information; to assure or set free from doubt or uncertainty; and to convince; or to solve a doubt, difficulty.

[24] Footnote 21 in paragraph [24] refers to ss 70 and 107. The other footnotes are omitted.

[25] The application of s 70 was recently considered by the Court of Appeal in *Southland Regional Council v Southland Fish and Game Council.*[11]

[26] The Court of Appeal referred to the Supreme Court decision in *Westfield* and observed:

> [20] It is also important to view this s 70 threshold in its full statutory context. The scheme of the RMA demands close control of activities that discharge contaminants into water or onto land which may result in that contaminant entering water. They are prohibited by s 15 unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan, or a resource consent. Regional councils are then given the responsibility of controlling discharges of contaminants and must evaluate (among other things) the efficiency and effectiveness of a proposed plan dealing with such discharges. This evaluation must contain a level of detail that corresponds to the scale and significance of the effects that are anticipated from the implementation of that plan.
>
> …
>
> [22] Completing the picture, as stated by s 107(1) of the RMA, subject to three exceptions, a consent may not be granted to discharge contaminants into water or onto or into land where those contaminants might enter water, if after reasonable mixing, any of specified effects are likely to arise. …
>
> [23] … Section 70 mandates an outcome and that outcome must be assured by the proposed rule before it is included in the regional plan. Plainly, whether that outcome is achieved by the rule, whatever its precise terms, is an evaluative matter upon which SRC must be satisfied, before the rule's inclusion. … Nothing in this judgment should be taken to presume that a particular form or type of evaluation is needed. …

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11 *Southland Regional Council v Southland Fish and Game Council* [2024] NZCA 499.

[27] The High Court made the following observation in *Environmental Law Initiative v Canterbury Regional Council*[12]

> [46] … It will be for the public decision maker to demonstrate that proper consideration was given to the statutory requirement and that it carried out its statutory obligation on the basis of a sufficient foundation of information to satisfy itself of that threshold.[13]

[28] It is clear from the above decisions that to be satisfied, the bar has been set at a high level that will be difficult to scale. Our response was to take a systematic and comprehensive bottom-up, step-by-step and multi-evidence approach that considered all relevant contributing factors, starting with a detailed review of the evidence already before us with fresh eyes focusing on the requirements of s 70(3). The scale and significance of the effects is high and that is reflected in the level of detail set out in this second interim decision.

[29] However, we note that PC1 can be differentiated from the cases considered by the higher Courts insofar as we are satisfied that the s 70(3) effects are occurring in large parts of the PC1 area. Section 70(3) requires the Court to be satisfied that the permitted activity standards in PC1 (or those standards in combination with any other provisions in the plan) will contribute to a reduction of those effects over a period no greater than 10 years. We adopted the provisions included in WRC's Final Proposal dated 1 December 2025 as the basis of our evaluation, noting that we have yet to finalise our determinations relating to them.

[30] PC1 covers an area of more than 1,000,000 hectares with variable geology, topography, rainfall and wind patterns throughout the area. It includes an estimated length of more than 18,000 km of rivers and streams, some 60 named lakes, 35 listed wetlands, and more than an estimated 10,000 wetlands greater than 500 m^2 in area.[14] Aquatic life includes all organisms living within the aquatic environments, including

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12 [2025] NZHC 4156.

13 *Whakatane District Council v Bay of Plenty Regional Council* [2010] NZCA 346, at [74].

14 Interim Decision at Tables 2 and 6, PC1 Table 3.11.3, Waikato Regional Plan Table 3.7.7 and responses to the Court's questions about estimates of costs for stock exclusion from PC1 waterbodies, 14 November 2023.

algae, periphyton, phytoplankton, macroinvertebrates, plants, fish, among others, some of which are endangered.

[31] Our evaluation has to consider a wide range of effects, diverse and variable contributing contaminant sources and natural spatial and temporal variations. It requires consideration of complex science, parts of which are not agreed among experts, and large information gaps and uncertainties. Different species of aquatic life are affected to differing extents by the different primary contaminants, which vary in concentrations in different parts of the PC1 area.

[32] By any yardstick, such an evaluation would be complex. In our view, having considered the PC1 issues in some detail, we find any such evaluation would involve so many variables and uncertainties that it would have no practical value. We note and share the following reservations expressed by Mander J in *The Environmental Law Initiative v Canterbury Regional Council* :[15]

> [110] I have considerable reservations whether, in any practical sense, the statutory test imposed by s 70 could realistically be applied to a proposed "region-wide" permitted activity rule for diffuse discharges, or reasonably be assessed with any degree of confidence given the variable states of freshwater bodies across the whole region at the time, the range of factors that applied to each, and the acknowledged uncertainties attaching to the available science. …

[33] Section 269(2) of the RMA provides that Court proceedings may be conducted without procedural formality where this is consistent with fairness and efficiency. We did not consider it would be efficient or effective to require parties to produce further evidence relating to s 70 without providing clear directions on what we would require to undertake our evaluation.

[34] Our detailed review of the evidence already before us included material relied on by the experts and referenced in their evidence. One example is WRC's *Te oranga o te taiao* |State of the Environment Report 2022 (**WRC's 2022 SOE Report**).

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15 [2025] NZHC 4156. The case involved an appeal against a decision of the Canterbury Regional Council relating to the adequacy of its consideration of the requirements of s 70 (prior to its amendment) before including a permitted activity for diffuse discharges in the plan.

While it provided general background material for the purposes of our Interim Decision, it contains significantly more detailed information relevant to our evaluation of s 70 issues.

[35] We became aware that The Waikato River Authority (**WRA**) commissioned NIWA to undertake "Trends analysis for selected indicators of Waikato River health and wellbeing 2010-2019", dated September 2020.[16] This relied on data from WRC monitoring programmes and other sources. It is a publicly available document commissioned by the co-governance entity with a clear mandate to protect and restore the health and well-being of the Waikato and Waipā river catchments. It is of considerable relevance to our s 70 evaluation and while we acknowledge it was not submitted in evidence, we do not see that any party would be disadvantaged by our consideration of it. Should any party consider they would be disadvantaged, we will seek that it be formally included in the Court record in response to this Second Interim Decision.

[36] We summarise the evidence relied on in relation to sources of contaminants, water quality and aquatic life in **Attachment 1**, which we consider provides a sufficient basis for us to make our determination without the need for further evidence. The evidence shows that some areas are improving, others continue to degrade and trends are indeterminate in others, and these vary over time. The aquatic environment does not differentiate between sources of contaminants that affect it and it is also affected by natural variability and climate change. Aquatic life is multi-faceted and requires consideration in the context of overall ecosystem health, which involves complex science.

[37] The scale and number of contributing factors and their uncertainties and variabilities in different parts of the PC1 area prevent any "region-wide" assessment of such effects for the purposes of our s 70 evaluation. The most appropriate way in which we can be satisfied that the s 70(3) requirements will be met is to be satisfied that the PC1 provisions, collectively, will result in diffuse discharges of the four primary contaminants being reduced over time to be as low as practicable, and to be

16 NIWA Project WRA 1151HN.

satisfied that will translate into a contribution to a reduction in s 70(3) effects. In our view, if that were not the case, the objectives of Te Ture Whaimana could never be met as we are satisfied that there is no alternative short-term way forward, consistent with the RMA, that could reduce further the discharges or their effects within 10 years.

[38] We direct parties to identify any further evidence they consider needs to be provided, but we stress this should be limited to evidence that could potentially mean a different determination would or could result. We also direct parties to identify any matters of fact, expert opinion or law of direct relevance to our s 70 evaluation that they consider have been omitted or not been interpreted or referenced appropriately.

A5 Future process

[39] Following receipt of submissions, we will determine the need for further evidence or any additional steps that may be necessary in consultation with parties. In the meantime, we make our determinations on matters set out in the directions in the first Interim Decision with a view to issuing a final decision on all matters as soon as possible.

PART B Background to our evaluation of whether the diffuse discharge of nitrogen, phosphorus, sediment and microbial contaminants can be authorised as permitted activities in accordance with the current amended s 70 of the Resource Management Act

B1 Reasons for the amendment and the introduction of s 70(3)

[40] The amendment to s 70 was introduced by Parliament to address a previous roadblock to including permitted activity rules in regional and district plans if the s 70 effects were already occurring in a receiving environment. The Government's objectives in amending s 70 are stated in the Regulatory Impact Statement: Managing discharges under s 70 of the Resource Management Act in relation to s 70(2) (**RIS**), as follows:

> [54] The objective is to enable discharges to be managed in a way that does not increase consent burden and enables freshwater improvement to occur over time, even in degraded catchments.
>
> [55] This recognises that receiving waters can already be subject to significant adverse effects on aquatic life; that authorising discharges through permitted activity rules can be consistent with improvement; and allows for that improvement to occur over an appropriate timeframe.

[41] In recommending the option that is now law, the RIS stated:

> [88] In the immediate term, it provides an effective and enduring solution to the issues with the counterfactual [*the status quo*]. It addresses the regulatory uncertainty by providing clear direction to councils. This enables regional plans to continue to use permitted activity rules to manage discharges, while still ensuring that environmental effects are managed through rules and improved over time.

B2 The purpose of s 70(3) and context in which our determination must be made

[42] The meaning of legislation must be ascertained from its text and in the light of its purpose and its context.[17]

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17 Section 10, Legislation Act 2019.

[43] It is clear from the RIS that the purpose of the legislation is to enable permitted activities to be included in a plan, subject to meeting the requirements of the amended legislation.

[44] Section 70(3) cannot be considered in isolation from s 32 or the wider framework of the RMA within which it sits. While s 70(3) is binary in that the Court must be satisfied that the provisions either will or will not enable the required contribution to a reduction in effects to be achieved, it does not specify how the reduction is to be defined or the quantum that must be achieved. These clearly require the exercise of discretion by the Court to determine what is appropriate based on the particular circumstances of the case, which must first include an understanding of the context in which its determination must be made.

[45] That context includes the large size of the PC1 area and extent of the aquatic environment in that area and the other matters summarised in paragraphs [23] and [27] in Part A4. It also includes:

(a) there is no collated monitoring information and no reliable up-to-date estimate as to the quantities of the primary contaminants discharged by the approximately 5,000 farming activities in the PC1 area, individually or collectively;[18]

(b) there is no collated information on what mitigation measures already have been implemented in accordance with PC1 requirements across the region, and there are no means of predicting with certainty what further mitigations will be practicable in the 10 years after PC1 becomes operative;

(c) it is not possible to assess the effects of individual farm discharges on the environment;

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18 Except for out-of-date catchment-wide predictions of nitrogen losses of uncertain reliability.

(d) there is no single metric that can be used to measure the effects of discharges on aquatic life, but we are satisfied that nutrients and sediment are significant contributors to these adverse effects;

(e) monitoring of water quality and aquatic ecology will not provide a statistically certain means of determining changes in the effects on aquatic life within 10 years, being the expected life of PC1;

(f) predictive modelling has large uncertainty at a local or river reach scale;[19] and

(g) to all intents and purposes, it will not be possible to predict or verify what, if any, region-wide changes in effects on aquatic life will have occurred in 10 years and it is more likely that 20 years or more will be required before reliable conclusions will be able to be drawn.

B3 What PC1 requires and the significance for our evaluation

[46] Development of the PC1 provisions started in 2012 and are close to finalisation after extensive and at times intensive periods of community involvement. The Court's first significant involvement occurred in March 2022. Since that time, appellant parties and the Court have put considerable effort into ensuring that, as far as reasonably practicable, the plan provisions are clear on their face, certain, workable, practicable, enforceable and as equitable as possible. We are satisfied that further amendment of the provisions would not increase certainty of compliance with s 70(3) beyond what PC1 already requires, and attempting to do so would result in significant further delays and high costs. Farm-specific solutions that are practical and affordable cannot be avoided.

[47] To be permitted, Policy 2(B)(a) requires farming (other than small and very low risk farming) to comply with minimum farming standards in Schedule C and to:

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19 *Aratiatia Livestock Limited v Southland Regional Council* [2022] NZEnvC 265, at [48].

> … demonstrate through an FEP, in accordance with Policy 4, that either the risk of diffuse discharges to water is already as low as practicable given the current land use or will be reduced to be as low as practicable within 10 years of becoming operative; …

[48] Policy 2(B)(b) requires farming[20] (other than dairy farming) with more than a low risk of diffuse discharges of the four primary contaminants to water to obtain a resource consent and to demonstrate the same risk outcome as for the above permitted activities.

[49] Dairy farming with more than a low risk of diffuse discharges of the four primary contaminants to water must also obtain a resource consent and Policy 2(B)(c)(ii) in WRC's Final Proposal dated 1 December 2025 requires a tailored risk-based approach to reducing the risk of discharges of the four primary contaminants to be as low as practicable within 10 years. Policy 2(B)(c)(vii) requires:

> … good management practices and mitigation measures to be recorded in FEP and implemented as soon as practicable and prioritised so that those predicted to be most effective in reducing the risk of diffuse discharges to be set out as a condition of consent and completed within the first five years of the consent, with steady progress over time.

[50] This overarching requirement for the risk of diffuse discharges to be reduced to be as low as practicable for both permitted activities and activities requiring a resource consent is important in our s 70 evaluation when considering what a "contribution to a reduction in significant effects on aquatic life" means in relation to PC1. Put another way, for permitted activities of diffuse discharges of the four primary contaminants from farming activities to be included in the Plan, we must be satisfied that the provisions will result in a contribution to reduction in those adverse effects to leave a residual that is the smallest amount practicable within 10 years. In our view that is an appropriate and practical starting point from which compliance with s 70(3) can be judged.

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[20] Farming is defined in PC1 as including commercial vegetable production.

[51] It will be important that when assessing practicability, consideration is given to implementing mitigations that will result in the greatest reduction in effects as soon as practicable. It will be important that the requirement for farming activities to implement mitigation measures as soon as practicable is clear to all parties. The word "practicable" is not defined in the RMA, the RPS, the Regional Plan or PC1. The term "reasonably practicable" was considered by the Court in *Royal Forest and Bird Protection Society of New Zealand v Whakatāne District Council*[21]. The Court referred to the definitions of "reasonably practicable" in the Health and Safety at Work Act 2015, noting that similar definitions are to be found in other legislation concerned with matters of health and safety. It went on to say:

> [51] These legislative examples are, perhaps unsurprisingly, consistent with well-established case law interpreting the meaning of "reasonably practicable." It has been held that the phrase is a narrower term than "physically possible" and implies a computation of the quantum of risk against the measures involved in averting the risk (in money, time or trouble), so that if there is a gross disproportion between them, then extensive measures are not required to meet an insignificant risk.[22] Where lives may be at stake, a practicable precaution should not lightly be considered unreasonable, but if the risk is a very rare one and the trouble and expense involved in precautions against it would be considerable but would not afford anything like complete protection, then adoption of such precautions could have the disadvantage of giving a false sense of security.[23] "Practicable" has been held to mean "possible to be accomplished with known means or resources" and synonymous with "feasible," being more than merely a possibility and including consideration of the context of the proceeding, the costs involved and other matters of practical convenience.[24] Conversely, "not reasonably practicable" should not be equated with "virtually impossible" as the obligation to do something which is "reasonably practicable" is not absolute, but is an objective test which must be considered in relation to the purpose of the requirement and the problems involved in complying with it, such that a weighing exercise is involved with the weight of the considerations varying according to the circumstances; where human safety is involved, factors impinging on that must be given appropriate weight.[25]

[52] In our view, the word "reasonable" is implicit in what is "practicable", with the latter conditioned by the former. We consider that when determining what is practicable, it will be necessary for WRC approved certifiers of FEPs to undertake

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21 [2017] NZEnvC 51.

22 *Edwards v National Coal Board* [1949] 1 KB 704; [1949] 1 ALLER 743.

23 *Marshall v Gotham* Co *Ltd* [1954] AC 360; [1954] 1 ALLER 937.

24 *Union Steam Ship Co of NZ Ltd v Wenlock* [1959] 1 NZLR 173.

25 *Auckland City Council v NZ Fire Service* [1996] 1 NZLR 330.

an assessment for each farm and it will be important that WRC provides clear guidelines as to how this is to be done so that farmers, their advisors, certifiers and Council Officers have a common understanding of what is required.

[53] This will require consideration of what is reasonably able to be done to reduce the risk of incidental discharges of the primary contaminants and reduce the risk of the s 70 effects occurring, taking into account "money, time or trouble" in accordance with the decision of the Court in *Royal Forest and Bird Protection Society of New Zealand v Whakatāne District Council.*[26] Within that framework, the timing of mitigations should be sequenced to prioritise those that will contribute most to reducing degradation in the particular circumstances that exist is the sub-catchment. The guidelines will need to be as clear on their face, certain, workable, practicable, enforceable and as equitable as possible.

[54] It will be important that all parties recognise and accept that practicality and affordability will be important considerations and that setting unrealistic expectations of what the Plan can or must achieve could or would delay the achievement of longer-term outcomes.

[55] The Court is aware that the Dairy Interests, Federated Farmers, Beef and Lamb, other farming organisations and HortNZ are proactively working with farmers and growers to improve farming practices and to reduce contaminant discharges. Some of them have been doing so for more than 10 years and reduced contaminant discharges resulting from mitigations implemented five to 10 years ago will already be showing up in receiving environments, at least those closer to the source of those mitigations. That is likely to have started contributing to a reduction in some s 70(3) effects, consistent with the provisions of PC1, albeit to a small extent currently. We have allowed for this as part of our s 70 evaluation.

[56] To do otherwise would be inequitable and would likely seriously adversely affect the way PC1 is viewed by the farming community. Further, at a practical level, there is no way to differentiate between reductions in s 70(3) effects resulting from

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26 [2017] NZEnvC 51.

mitigations that have already been implemented and any that will be implemented in the next 10 years, meaning such an exercise would be fruitless.

[57] The requirement to reduce discharges to be a low as practicable in Rule 3.11.4.3 and in other rules is a requirement to adopt the best practicable option in RMA terms. Before that can be a requirement, WRC and in this case the Court must consider s 70(2). As will be seen in Part M, we considered the only alternative to including the Rule, which would be to require a resource consent for all farming activities that result in diffuse discharges of the primary contaminants from farming activities.

B4 Principles guiding our evaluation

[58] We set out below the principles we relied on in our evaluation:

(a) Our determination must be made in accordance with the law at the date of our decision.

(b) The vision and strategy Te Ture Whaimana is intended by Parliament to be the primary direction-setting document for the Waikato River and activities within its catchment affecting the Waikato River. It prevails over any inconsistent provision in a National Policy Statement, a New Zealand Coastal Policy Statement and a National Planning Standard.

(c) The achievement of the interim water quality targets in Table 3.11.1 of PC1 is not a prerequisite for permitted activities to be included in PC1. Interim target water quality attribute states were agreed by the parties, which represent 20% of the long-term improvement required and we do not revisit them. However, as stated in our Interim Decision:[27]

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27 Interim Decision, at [1155].

> While we understand the reasons for including interim targets, they raise expectations that may not be met. Based on the evidence, they cannot be anything other than aspirational, their achievability is uncertain at best and reliable monitoring unlikely to be possible in the case of nitrogen at least. They do not form an appropriate metric for measuring the success or failure of PC1 and need to be seen as representing a "best endeavours" target only.

(d) For permitted activities to be included in the Plan, we must be satisfied that the provisions will result in a reduction in those adverse effects to be the smallest amount practicable within 10 years.

(e) While PC1 sets interim water quality targets, water quality is one of five components of ecosystem health, the others being water quantity, habitat, aquatic life and ecological processes, all of which need to be managed.[28] Our assessment of adverse effects on aquatic life is based on consideration of all of the above components and factors that affect them.

(f) The "environment" is not a static concept; it is constantly changing and cannot be viewed in isolation from all operative extraneous factors.[29]

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28 NPSFM 2020, at Appendix 1A.

29 *Far North District Council v Te Runanga-A-Iwi o Ngāti Kahu* [2013] NZCA 221, at [80].

Part C Sources of contaminants contributing to s70(3) effects

C1 The evidence

[59] We summarise the evidence we relied on in Attachment 1, Part C.

C2 Our findings in relation to sources of contaminants

[60] We accept Dr Scarsbrook's evidence that "There is a strong link between the extent and intensity of pastoral agriculture and degraded water quality. Levels of contaminants tend to increase with the extent and intensity of pastoral agriculture".[30] In doing so we note that there was significant intensification of pastoral agriculture within the Waikato-Waipā catchment over the last two decades and around half of Waikato's total land area (2.5 million km^2) is in pastoral land use.[31]

[61] Based on his estimates of nitrogen excreted from farmed livestock, Dr Scarsbrook advised that those from dairy cattle increased by approximately 60% between 1990 and 2020. The peak level was in 2005-06, although they continued increasing until 2014 and subsequently plateaued. Nitrogen excreted by sheep reduced by approximately 50% over the same period.

[62] Our understanding is that there is no dispute that diffuse discharges of the four primary contaminants from farming activities make up a significant proportion of all anthropogenic discharges in the PC1 area, but there are others. These include natural sources, as discussed in Attachment 1 and point source discharges, which indicatively contribute 6% of Total Nitrogen and 15% of Total Phosphorus loads in the PC1 area.

[63] Forestry occupies around 10% of land area in the PC1 area[32] and contributes to sediment loads. WRC's 2022 SOE Report stated that "Council monitoring will not reveal the consequences of easing sediment controls through the National

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30 Dr Scarsbrook EIC, at [19].
31 Dr Scarsbrook EIC, from [149].
32 Interim Decision, at Table 2.

Environmental Standards for Plantation Forestry (2017) until after most forests have been harvested". We received no evidence relating to forestry, nor do we consider it would change our s 70 evaluation if we had. However, if increases in sediment discharges were to occur from forestry operations in the future, it would further complicate future assessments of reductions in s 70(3) effects resulting from improved farming practices. Evidence given in 2019 was that non-pastoral land uses like plantation forestry accounted for 7% of phosphorus discharges.[33]

[64] Other land uses occupy approximately 20% of the PC1 land area. Roading infrastructure can be a significant but unquantified source of sediment loads to different aquatic receiving environments, particularly after heavy rain and where slips occur. The frequency and extent of such events is expected to increase in the future due to climate change. Urban areas contribute sediment and other contaminants in stormwater run-off.

[65] We received evidence that "Koi Carp infestation is completely outside the control of farmers and contributes hugely to the sedimentation in the streams. It makes any efforts on other mitigation to reduce sedimentation ineffective".[34]

[66] *E. coli* are discharged by birds and all warm-blooded animals, although farm animals are the primary source.

[67] Our overall finding in relation to sources of contaminants is that the number of different sources and their variability, together with the many other variables that require consideration in relation to adverse effects on aquatic life in particular, prevent any "region-wide" assessment of such effects. This is consistent with the reservations expressed by Mander J. A key requirement is to be satisfied that the PC1 provisions, collectively, will result in diffuse discharges of the four primary contaminants being reduced to be as low as practicable.

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33 Dr Depree EIC, at [4.7].

34 Mr Kim Robinson EIC, at [17].

Part D The existing state of water quality in the PC1 area

D1 The evidence

[68] We summarise the evidence we relied on in Attachment 1, Part D.

D2 Our findings in relation to the state of the existing water quality environment

[69] Te Ture Whaimana states that the Waikato and Waipā Rivers are degraded, should not be required to absorb further degradation as a result of human activities and require, amongst other things, restoration and protection.[35]

[70] It is clear from the first Interim Decision that water quality of the Waikato River ranges from high (attribute bands A or B[36]) at its source, Lake Taupō, to poor by the time it reaches the Lower Waikato FMU, where water quality attributes are in C or D bands (D being below the national bottom-line (**NBL**)). Much of the Waipā River has low water clarity and high *E. coli* levels that fail to meet swimmable criteria, meaning the water in not suitable for consumption by farm animals. Most peat and riverine lakes are below the NBL for total nitrogen, total phosphorus and chlorophyll *a*. We stated in the Interim Decision[37] that we were satisfied from the evidence that anthropological hydrological changes contribute to the degraded state of the Whangamarino Wetland, which is unrelated to any effects from farming activities.

[71] While PC1 was not intended to and does not give effect to the NPSFM, the NPSFM interprets degraded as a site or sites in the FMU or part of the FMU to which a target attribute state applies is below a NBL. The Environment Court found in relation to the Southland Regional Plan appeals that attributes that are below the NBL or minimum acceptable state are causing significant adverse effects on aquatic

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35 Te Ture Wahimana Vision and Strategy.
36 National Policy Statement for Freshwater Management 2025 (**NPSFM**).
37 at [830].

life.[38] Dr Scarsbrook stated that the surface water quality of the Waikato-Waipā River catchment can be characterised as generally degraded.[39]

[72] WRC considers that many Waikato Region waterways (or parts of them) may already be subject to conspicuous change in colour or visual clarity under ss 107(1)(d) or are unsuitable for consumption by farm animals under ss 107(1)(f).[40]

[73] For the above reasons, which are expanded on in the Interim Decision, we agree with and accept Dr Scarsbrook's evidence that the surface water quality of the Waikato-Waipā River catchment can be characterised as generally degraded. We are satisfied, after focussing on s 70(3) effects specifically, that the degraded state water quality is contributing to s 70 effects in large parts of the PC1 area.

[74] However, not all water bodies are degraded and require restoration. The current state of water quality and effects on aquatic life ranges on a continuum from not degraded in the upper reaches of catchments, to significantly degraded in the lower part of catchments. The extent of degradation resulting from the presence of the four primary contaminants both individually and collectively is highly variable across the extensive range of water bodies in the region. This is important as it means that reductions in s 70(3) effects can be expected to occur at different places and at different rates throughout the PC1 area as the PC1 provisions take effect.

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38 *Aratiatia Livestock Limited v Southland Regional Council* [2022] NZEnvC 265, at [266].
39 Dr Scarsbrook EIC, at [18], [19] and [40].
40 Memorandum dated 28 April 2025, at [15].

Part E Effects on aquatic life

E1 General background

[75] The RMA defines aquatic life as:

> (a) means any species of plant or animal life that, at any stage in its life history, must inhabit water, whether living or dead; and
>
> (b) (includes seabirds (whether or not in the aquatic environment).

[76] Aquatic life is one component of ecosystem health as defined in the NPSFM, which identifies ecosystem health as a compulsory value with five biophysical components "and it is necessary that all of them are managed"[41]:

> (a) water quality, including the physical and chemical measures of the water, such as temperature, dissolved oxygen, pH, suspended sediment, nutrients and toxicants;
>
> (b) Water quantity, including the extent and variability in the level or flow of water;
>
> (c) Habitat, including the physical form, structure, and extent of the water body, its bed, banks and margins; its riparian vegetation; and its connections to the floodplain and to groundwater;
>
> (d) Aquatic life – the abundance and diversity of biota including microbes, invertebrates, plants, fish and birds; and
>
> (e) Ecological processes – the interactions among biota and their physical and chemical environment such as primary production, decomposition, nutrient cycling and trophic connectivity.

[77] The NPSFM also refers to the extent to which parts of receiving environments support a population of threatened species and the need for critical habitats and conditions to support the presence, abundance, survival, and recovery of the threatened species. There are other matters identified that are relevant to the requirements of s 70 relating to any conspicuous change in the colour or visual clarity and the rendering of fresh water unsuitable for consumption by farm animals. These include microbial pathogens, water clarity, deposited sediment, plant growth

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41 NPSFM 2020, at Appendix 1A.

(from macrophytes to periphyton to phytoplankton), cyanobacteria, other toxicants, and litter.

[78] In terms of effects on aquatic life, the NPSFM includes examples of attributes affected by nutrients as including periphyton, dissolved oxygen, submerged plants (invasive species), fish, macroinvertebrates and ecosystem metabolism.[42]

[79] Objective (e) of the Te Ture Vision and Strategy requires an integrated, holistic and co-ordinated approach to management of the natural, physical, cultural and historic resources of the Waikato River. To be consistent with the objective, with the NPSFM, while not giving effect to it, and with the purpose of the RMA, our assessment of effects on aquatic life must be undertaken by considering the natural environment as a whole, with all its influences, variabilities and competing interests.

[80] The State of the Environment monitoring programmes that formed the basis of WRC's 2022 SOE Report include the Regional Rivers Water Quality Monitoring Programme (**RERIMP**), which was implemented in 1993 and covers 60 sites within the PC1 area. A major redesign of the programme was implemented in 2018 to incorporate 10 new sites added as part of PC1. In addition to the RERIMP sites, the Waikato River Monitoring Programme (implemented 1989) monitors water quality at 12 sites along the Waikato mainstem. Lake, groundwater and river ecology monitoring programmes are also in place.[43]

[81] Attributes or indicators considered in the programme include water clarity (black disk), *E. coli*, total nitrogen, dissolved oxygen, phytoplankton (using chlorophyll *a* as a surrogate), water temperature, ammoniacal nitrogen, arsenic, macroinvertebrates (MCI, QMCI, %EPT abundance, % EPT taxa), periphyton (cover of long filaments, cover of thick mats), macrophytes (channel clogged by

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42 at [3.13].
43 Dr Scarsbrook EIC, at [122].

macrophytes, exotic cover, native cover) and riparian health (channel shade, riparian vegetation protection, riparian width).

[82] Our evaluation requires us to be satisfied that the PC1 provisions will contribute to a reduction in s 70(3) effects within 10 years. The evidence is clear that aquatic life can improve at some monitored locations while declining at others, and that it is not be possible to determine if it is improving or declining at others. It would be unrealistic and futile to attempt to evaluate some 20 individual attributes or indicators at more than 100 separate monitoring locations.

[83] The Parliamentary Commissioner for the Environment recommended that:[44]

> The purpose of state of the environment reporting be to inform the public and decision-makers of the current state and long-term trends in the environment. It should identify and explain environmental issues, including their causes and location, and contain conclusions about their significance.

[84] For reasons of practicality, we focus on the current state of the existing aquatic environment and the effects of the four primary contaminants. Our focus must be to look forward to what reductions in effects will occur as a result of the PC1 provisions. However, trends provide an important source of information when assessing cause and effect. As one example we discuss further below, increasing nitrogen concentration loads, in part at least, are likely to be an artefact of past intensification of dairy farming from which the increased nitrogen is still reaching receiving environments because of groundwater lag times.

[85] WRC's 2025 SOE Report describes the state of the Waikato region's environment through 2022 and makes recommendations to improve environmental outcomes. It is clear to us that the monitoring undertaken by WRC is comprehensive and provides a sound basis for SOE purposes.

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44 *The State of New Zealand's Environment*: Commentary by the Parliamentary Commissioner for the Environment on Environment Aotearoa 2015, 29 June 2016 at [5.1].

[86] The WRA commissioned NIWA to undertake "Trends analysis for selected indicators of Waikato River health and wellbeing 2010-2019", dated September 2020.[45] It is of considerable relevance to our s 70 evaluation and while we acknowledge it was not submitted in evidence, we do not see that any party would be disadvantaged by our consideration of it. Should any party disagree, we will seek that it be formally included in the Court record as a response to this Interim Decision.

[87] We considered which attributes or indicators are the most appropriate to enable us to be satisfied that there will be a contribution to a reduction in s 70(3) effects within 10 years. When considering appropriate metrics to be used to assess effects on aquatic life in *Aratiatia Livestock Limited*, the Court found:[46]

> While agreeing with him that MCI scores are a useful indicator of riverine ecological health, the suitability of a single attribute as a measure of the biophysical components of ecosystem health was contested by several experts. On this topic we prefer the evidence of Drs Canning, Snelder and J Kitson and of Ms K McArthur, and find no single metric is adequate and that focus on a single attribute has the potential to give rise to a misleading perception of an ecosystem's health.

[88] WRC's 2022 SOE Report relies in part on data relating to the ecological state of regional wadeable streams in the Waikato region sourced from WRC's Technical Report 2022/32, which commented:[47]

> Although the NPS-FM (2020) requires reporting of specific indices for ecological health, as alluded to above, the current indices are likely to lack the sensitivity required to address declines before they have already occurred thus limiting their relevance for effective management. Since different organisms and groups respond differently to different stressors, we propose that a variety of indicators should be used and combined to provide a more complete picture of state and to target relevant stressors more effectively. …

[89] Based on the above case law, comment in Technical Report 2022/32 and the evidence referred to in Attachment 1, we are satisfied that there is no single metric that can be used as a proxy of ecosystem health and more specifically, effects on aquatic life.

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45 NIWA Project WRA 1151HN.

46 *Aratiatia Livestock Limited v Southland Regional Council* [2022] NZEnvC 265, at [67].

47 Pingram M., David B., Squires N., Smith J and Hamer M: Current ecological state of wadeable streams in the Waikato region 2018-2020, March 2023, at [4.7].

[90] We also note that extensive expert conferencing was undertaken in relation to water quality and ecosystem health as part of the Southland hearing process. The Fifth Interim Decision recorded that the experts "reported that for sites lacking monitoring data, models were useful in providing an overview of water quality and ecological state at a regional and sub-regional scale, but that the models also have large uncertainty at a local or river reach scale".[48]

[91] We confirmed in the Interim Decision that we can have limited confidence that the [economic] model predictions reliably represent the situation that exists today. This included limited confidence in the environmental improvements predicted as noted elsewhere in the Interim Decision.[49] As can be seen in Parts F2 and J2, Dr Ausseil and Dr Chrystal both questioned some of the model assumptions.

[92] We do not consider that the 20% improvement in water quality recommended by the Council Hearing Panel[50] when setting interim water quality targets for sediment (water clarity) and *E. coli* has been demonstrated to be achievable for the purposes of our s 70 evaluation and we do not rely on it. Instead, we undertake our own assessment in Part E3 and other parts of this decision.

[93] We have previously identified other factors we must take into account in our evaluation and consider them further below, including groundwater processes and travel times to the extent relevant to our evaluation of s 70 effects in surface waters and the potential effects of climate change.

[94] Overall, our evaluation must consider all aspects of aquatic life, a wide range of effects and diverse contributing factors, many of which involve complex science and significant information gaps and uncertainties. As noted above, that is no easy task and requires the exercise of considerable judgement.

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48 *Aratiatia Livestock Limited v Southland Regional Council* [2022] NZEnvC 265, at [48].
49 At [612], [1066] and [1149].
50 Recommendation Report, at [18].

E2 Evidence relied on

[95] We summarise the evidence we relied on in Attachment 1, Part E.

E3 Our findings in relation to significant adverse effects on aquatic life

[96] Based on both the water quality and ecology evidence, we are satisfied that significant adverse effects on aquatic life are occurring in many parts of the PC1 area.

[97] For the reasons stated in Part E1, we are satisfied that there is no single metric that can be used as proxy of ecosystem health and more specifically, effects on aquatic life.

[98] We are satisfied that monitoring alone cannot be relied on to assess effects on aquatic life across the PC1 area, which would need to rely on predictive modelling. We discussed modelling in Part E1 and, while the PC1 modelling evidence presented to the Court did not include ecological modelling, we consider that currently available modelling accuracy would not be sufficiently certain to reliably predict future changes in significant adverse effects on aquatic life for s 70 regulatory purposes.

[99] Based on the evidence, we are satisfied that trend analysis will be the most appropriate method of monitoring change in effects on aquatic life in the future for the purposes of s 70 and that trends should be assessed over a period exceeding 10-years to overcome variability associated with natural cycles. We consider that period should be at least 20 years to provide a reasonable level of certainty and may need to be longer still.

[100] The period of monitoring trends in ecological health in the PC1 area to date is too short to draw any firm conclusions but the available evidence is that some trends are improving, some are declining and many are indeterminate. However, based on our understanding of the evidence as a whole as presented to us, we accept

the above finding in the WRA Report that there is a continuing deterioration in the health of the river and its tributaries.

[101] We accept Dr Ausseil's evidence in Attachment 1, Part E1 relating to natural variability and sampling error. We are also cognisant of the 10-year increase in *E. coli* concentrations from 2010. These highlight the importance of taking a long-term view when assessing trends. We discuss this further below.

[102] We are satisfied from the evidence that nitrogen, phosphorus and sediment are all significant contributors to adverse effects on aquatic life. There appear to be differing views among experts on the relative significance between them but for the purposes of our current evaluation, we consider that to be too fine grained to be material. PC1 requires that discharges of all of them reduce. However, based on the following finding, the effects of sediment are significant by themselves:[51]

> … c. 60% of wadeable stream length estimated to have more than 40% streambed cover. Importantly, negative effects on aquatic communities are well-documented to occur when surficial coverage of the stream bed by fine sediments exceeds a threshold of 20%, illustrating the widespread scale and ecological significance of this stressor across the region. …

[103] We note and agree with Dr Ausseil's opinion that meeting the phosphorus and nitrogen target attribute states in the lower Waikato River will require reductions of nitrogen and phosphorus loads across the whole catchment. This was accepted by the Hearing Panel[52] and is already a requirement of PC1. We also consider the same needs to apply to sediment and *E. coli* reduction requirements. The fact that PC1 requires a whole of catchment approach to reducing discharges of the primary contaminants is an important contributing factor to reducing s 70 effects.

[104] In view of the above findings and Mander J's observations in Part A4 relating to the practicality of applying the statutory test imposed by s 70 to a proposed "region-wide" permitted activity rule for diffuse discharges, any expectation of precision when assessing changes in significant adverse effects on

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51 Technical Report 2022/32, at page vi.
52 Recommendation Report, at [952].

aquatic life would be unrealistic. Our decision is based on pragmatism and judgement based on the Court's wide experience of cases involving the discharge of contaminants from farming activities. There is no alternative basis for our determination.

Part F Conspicuous changes in the colour and visual clarity of receiving environments

F1 What is meant by "conspicuous changes in colour and visual clarity", what can affect it and how do you assess it?

[105] What is meant by "conspicuous changes in colour and visual clarity" is not defined in the RMA, the NPSFM or any Waikato regional planning document as far as we were able to ascertain. The Ministry for the Environment prepared guidelines[53] to assist in determining such changes and while these have been used to assess changes resulting from point source discharges, the Court is not aware of them having been applied to diffuse discharges. By way of an example, the Southland Water and Land Plan defines a conspicuous change in clarity as "more than a 20% reduction in clarity in all lakes, rivers, modified watercourses and wetlands, except for Lowland soft bed rivers where it means more than a 33% reduction in clarity".

F2 The evidence

[106] Dr Depree stated that visual clarity is impaired by both phytoplankton (chlorophyl *a*) and inorganic sediment. We summarised evidence on sediment in Part C4 of Attachment 1. In the lower Waikato, phytoplankton is a minor contributor (around one-third) with the major contributor being sediment/silt (around two-thirds). He provided the following example of the lower mainstem from the Waipā and Opuatia.

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[53] MfE (1994). Water Quality Guidelines No. 2 – Guidelines for the management of water colour and clarity. Ministry for the Environment, Wellington, New Zealand, June 1994.

[107] He stated that the number of sub-catchments classified as over-allocated for sediment is greater than the number in which nutrient reductions are required. He also stated that:[54]

> Soil erosion is highly variable across the PC1 catchment ranging from <50 t/km²/yr to >5,000 t/km²/yr. The majority of soil erosion is concentrated in a few sub-catchments within the Waipa and Lower Waikato FMUs. The 'top five' sub-catchments with the highest average soil erosion (Mangarama, Mangarapa, Mercer, Whangape and Opuatia account for 7% of the area, but contribute almost 40% of total soil erosion in the PC1 catchment.

[108] Dr Ausseil questioned the modelled predictions of sediment reductions that would be achieved. He referred to the assumed "efficacy of farm plans for sediment remediation" being 70%.[55] He set out his understanding of the provenance of the assumptions relied on. He stated that he had not reviewed all the mitigation efficacy assumptions in the model, but based on his concerns, he suggested they may benefit from a thorough review. Dr Chrystal raised similar concerns about the achievability of a 70% improvement.

[109] He analysed the relative improvements in water clarity required to meet the short-term attribute states, which showed that improvements of greater that 20%

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54 Dr Depree EIC, at [1.10].
55 Dr Ausseil EIC, at [106].

were required in more than half of the sub-catchments and substantially more at some sites.[56]

F3 Our findings in relation to conspicuous changes in the colour and visual clarity of receiving environments

[110] We find that adverse effects are occurring over large parts of the PC1 area.

[111] We also find that there is no established quantitative method of assessing changes arising from diffuse sources. As a consequence, our evaluation must be based on an objective assessment of what reductions in contaminant discharges are likely to result from the implementation of PC1 and in what timeframes.

[112] It is clear that measures to reduce sediment loss will be very different in areas with highly erodible soils compared to those with less erodible soils and will require much greater mitigation measures that can be achieved using what are normally considered good farm management practices. We return to this in our evaluation of contaminant reductions that can be achieved by the PC1 provisions, including modelled sediment reduction predictions.

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56 Dr Ausseil EIC, at Table 5.

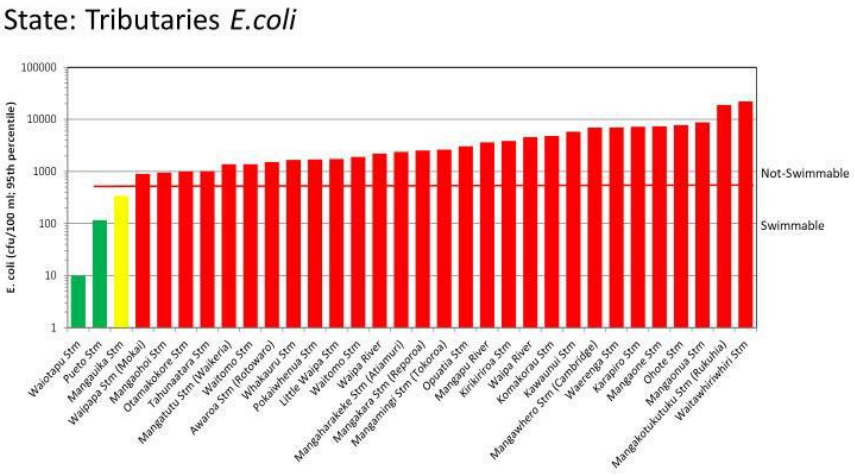
Part G The rendering of fresh water unsuitable for consumption by farm animals

G1 Relevant guidelines

[113] The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2023) guideline is that drinking water for livestock should contain less than 100 cfu[57]/100 mL (median value) of *E. coli*. We note that Table 3.11-1(a) refers to the recreational water quality median guideline value of 130 cfu/100 mL. At that higher limit, reductions in *E. coli* will be required in more than two thirds of the 72 sub-catchments, some by between five and 10 times, indicatively. Clearly, greater reductions will be required to meet the lower water quality guideline value for stock watering.

G2 The evidence

[114] Dr Scarsbrook included the following figure which shows the state of *E. coli* (95th percentile value for data 2009-2014) at tributary sites throughout the Waikato-Waipā catchment. The 95th percentile guideline is 540 cfu/100 mL or four times the median value.



57 Colony forming units.

[115] *E. coli* concentrations increased between the baseline 2010 to 2014 period and the 2018-2022. A figure attached to Dr Scarsbrook's evidence indicated that median levels increased by around 60 to 70%. He considered the result was surprising given the extent of improvements that have been made in riparian management and dairy effluent disposal practices. WRC commissioned NIWA to investigate likely causes.[58] In the five-year period 2015-2019, *E. coli* concentrations were decreasing at three of 70 sites (4%) in the Waikato-Waipā catchment, increasing at 59 sites (84%), and indeterminate or not assessed at five sites (12%). NIWA reported:[59]

> The increases in E. coli concentrations were not significantly correlated with changes in livestock density or land use, and were of similar relative magnitude in predominantly pastoral, forested, or urban catchments. The increase in faecal contamination occurred in streams across all major land uses in the Waikato region, including native and plantation forest, making it unlikely that the general trend is related to management actions on livestock farms. …

[116] The SOE Report included the following summary of water quality for swimming.

Water quality for swimming 2015 to 2019			
Catchments	Excellent	Satisfactory	Unsatisfactory
Upland Waikato	0.1	38.2	61.7
Waipā River	1.9	15.0	83.2
Lowland Waikato	0.0	5.2	94.8

[117] Dr Ausseil questioned WRC's modelled predictions that most water quality targets may be met, both in the short and long-term, and was generally concerned by those relating to *E. coli* and sediment/water clarity.[60] He found the predictions that they would be met at most sites, often for the interim targets by a vast margin, "surprisingly optimistic", "especially in light of the actual degradation in *E. coli*

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58 *E. coli trends in Waikato streams*, Exploration of drivers and alternative trend analysis, Prepared for Waikato Regional Council by S Woodard,S Elliot, R Davies-Colley & R Stott (NIWA), June 2022, Report IS 2022/09.

59 Report IS 2022/09, at page 9.

60 Dr Ausseil EIC, from [104].

concentrations over the last 8 years in spite of the implementation of a range of mitigation practices". He stated that the assumptions do not appear to have been reviewed since the original modelling work in 2015.

G3 Our findings in relation to the rendering of fresh water unsuitable for consumption by farm animals

[118] We find that adverse effects are occurring over large parts of the PC1 area and that large reductions in *E. coli* concentrations will be required before fresh water will be suitable for consumption by farm animals.

[119] We note NIWA's findings in Part G2 and, whatever the correct explanation, it reflects an historical situation that does not change the requirements for our s 70 evaluation, which must look to the future. It will not change the requirement that we must be satisfied discharges that implementation of the PC1 provisions will contribute to a reduction in the s 70(3) effects within 10 years with a consequent reduction is s 70(3) effects.

Part H The role of groundwater, including travel times from farm to receiving environments, reductions in contaminant discharges due to attenuation and nitrogen load to come

H1 Our evaluation

[120] As noted in the Interim Decision, we were unable to obtain a reliable sense of the likely extent of nitrogen load to come or the lag time before it appeared in different receiving environments. Evidence before the Council Hearing Panel was that groundwater travel times and hence the timeframe for nitrogen to appear in receiving waters would be 10 to 15 years. An exception is in the Upper Waikato/Lake Taupo sub-region and the Waihou River catchment, where mean transit times determined in some of the rivers concerned ranged from approximately 30 to 50 years under low-flow conditions.[61]

[121] Based on the estimated groundwater travel time of 10 to 15 years, any reductions in nitrogen discharges achieved in most parts of the PC1 area as a result of new mitigations on farms closest to receiving environments can be expected to start benefitting in those receiving environments within around three to four years of PC1 becoming operative in a small way. These benefits will increase through the term of PC1 but farms furthest from receiving environment would not result in reduced effects on aquatic life within 10 years.

[122] We also satisfied that some farmers have already gone some way towards implementing mitigations required by PC1, starting up to 10 years ago in terms of fencing streams on dairy farms and improving dairy effluent management, as two examples.[62] The benefits of some of these mitigations can reasonably be expected to have reduced contaminants reaching receiving environments close to where the mitigations are located and while they cannot be quantified and are likely to be

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61 Interim Decision, at [285] by reference to Roland Stenger *Nitrogen lag review* (Lincoln Agritech Ltd, Report 1058-14-R1, June 2022), at [6.1].

62 Interim Decision, at Tables 5 to 8 and Mr Aslan Wright-Stow EIC at [5.23], as an example.

relatively limited in extent, they should be recognised and we have taken them into account in our evaluation.

[123] With regard to nitrogen load to come, as noted in Part C2, and based on his estimates of nitrogen excreted from farmed lifestock, Dr Scarsbrook considered that dairy cattle increased by approximately 60% between 1990 and 2020. The peak level was in 2005-06, although they continued increasing until 2014 and subsequently plateaued. We consider it likely that increased nitrogen loads resulting from later increased dairy cattle numbers will continue to reach some receiving environments to a decreasing extent during the life of PC1. It is likely that there is a nitrogen load to come from the Upper Waikato/Lake Taupo sub-region at a future date but that might not appear in receiving environments during the term of PC1 and its size is unknown.

[124] These increased loads were generated at a time when there were few regulatory controls on farming activities and we discount them for the purpose of our s 70 evaluation. However, the increases will continue to occur in some receiving environments and for a time may continue to exceed reductions appearing in those environments as a result of implementing of PC1 mitigations. This will add further to the difficulty of confirming reductions in adverse effects on aquatic life by either monitoring or predictive modelling, reinforcing the need to allow 20 years or more before conclusions are likely to be possible.

[125] We note the reference in WRC's 2022 SOE Report in Part D2 that increasing nitrogen in streams would be driven by shallow groundwater pathways where there is little denitrification. We accepted that for the purpose of our evaluation.

H2 Our findings

[126] It is not possible to make definitive findings about any of the matters discussed in this Part H because of the large size of the PC1 area and the lack of data to undertake any kind of scientific or statistical analysis. However, based on the Court's experience of such issues, we are satisfied that:

(a) Indicatively, putting aside the effects of nitrogen load to come, the benefits of reduced discharges of nitrogen from both earlier mitigation measures can reasonably be expected to have reached some receiving environments now in a small way. Those from new mitigations will start to reach receiving environments within about three to four years of PC1 becoming operative and will progressively increase through the term of PC1 as a result of additional new mitigations.

(b) This will contribute to increasing reductions in the s 70 effects progressively for the remainder of the term of PC1. In parts of catchments immediately downstream from where degradation starts to occur, relatively small reductions in contaminant loads can reasonably be expected to restore aquatic life to a healthy state relatively quickly, with longer timeframes being required further down the catchments.

(c) Increased nitrogen loads reaching receiving environments as a result of historical land use intensification could continue in some areas for the first few years of the term of PCI, masking or possibly exceeding any reductions resulting from the implementation of PC1 in some receiving environments.

(d) In the Upper Waikato/Lake Taupo sub-region and the Waihou River catchment, "nitrogen load to come" is likely to be observed at some later date and may not occur within 10 years of PC1 becoming operative; and

(e) it will not be possible to monitor or use modelling to predict what changes will occur within 10 years of PC1 becoming operative.

Part I Climate change

[127] Climate change is increasingly a matter to be considered when assessing effects on aquatic environments. PC1 Policy 8b requires recognition that changes will need to continue more than 10 years after PC1 is operative to respond to the reasonably foreseeable effects of climate change. It is identified in WRC's 2022 SOE Report as a concern. It was identified as a driver of decline in fish diversity and abundance by Ms McArthur.[63] Dr Ausseil identified climate change as an issue that was not addressed in PC1.[64] Dr Scarsbrook stated that WRC had concluded that shallow lakes are under pressure from climate change.[65]

[128] Dr Depree referred to recent research in New Zealand which showed that climate factors tend to 'swamp' land management factors.[66] The reference stated:

> At catchment scales, water quality responses to all environmental drivers are mediated by biophysical processes, including contaminant mobilisation, transport, attenuation and dilution … . These processes are strongly influenced by interannual climate variability, producing variation in water quality that may mask responses to anthropogenic drivers … . The primary sources of interannual climate variability are global-scale cyclic processes such as the El Niño–Southern Oscillation (ENSO) and the North Atlantic Oscillation (NAO); these processes produce temporal variations in temperature and rainfall, which, in turn, influence the biophysical processes identified above.
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> …
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> Our model results indicate that SOI trends are associated with trends in the six water quality variables at the 10-year timescale and, to a lesser degree, at the 20-year timescale. The lack of consistent and certain associations between land use indicators and water quality trends at the 10-year timescale indicates that land use signals were generally swamped by the noise of climate variability.

[129] While this has particular relevance to PC1, it is not something we can rely on as the authors were not available for cross examination or questioning by the Court. However, the Court considered correlations between increasing and decreasing

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63 Ms McArthur EIC, at [40].

64 Dr Ausseil EIC, at [93].

65 Dr Scarsbrook EIC, at [94]

66 Dr Depree EIC, at [3.25], citing T Snelder, C Fraser., S Larned, R Monaghan., S De Malmanche & A Whitehead (2022) Attribution of river water-quality trends to agricultural land use and climate variability in New Zealand. Marine and Freshwater Research 73, 1-19. https://doi.org/10.1071/MF21086.

variations in concentrations of nitrate in the Springs in relation to the Te Waikoropupū Springs Water Conservation Order. In that case, the Court stated:[67]

> Our interpretation of this evidence is that, while rainfall is a major driver of leaching, peak rainfall intensities and increased general "wetness" of the soils result in increased leaching compared to when the soils contain less water. The evidence as presented was insufficient to satisfy us that the SOI is, in and of itself, an indicator of changing NO^3-N concentrations and/or loads reaching Te Waikoropupū.

[130] However, the Court found that:[68]

> [645] … The potential effects of climate change are a further consideration when setting a limit that could be in place for a substantial number of years. …

[131] Noting that finding, and the consistent expert evidence before us, we are satisfied that climate change is highly likely to be contributing to upward and downward variations over time in nitrate concentrations (at least) in aquatic receiving environments and to any related effects on aquatic life.

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67 *Re Ngāti Tama Ki te Waipounamu Trust* [2023] NZEnvC 157, at [360].

68 *Re Ngāti Tama Ki te Waipounamu Trust* [2023] NZEnvC 157, at [645].

Part J Evidence relating to reductions in contaminant discharges likely to be achieved by the PC1 provisions

J1 Reductions required to meet the PC1 Interim Water Quality Targets

[132] The PC1 target is a 20% change between current water quality and the long-term water quality over the length of the Waikato River so that it is safe for people to swim in and take food from over its entire length by 2096. Based on Dr Ausseil's evidence,[69] an 11.5% improvement (reduction) in the anthropogenic load of phosphorus and a 7.2% reduction in the anthropogenic load of nitrogen will be required at the bottom of the Waikato River catchment, not at the point of leaving the farm.

[133] The following table summarises median *E. coli* concentrations at 71 monitored sites in broad bands indicating the values based on 2010 to 2014 monitoring data and the 10-year targets with a 20% reduction, based on PC1 Table 3.11-1(a) and its addendum. Current numbers are likely to be higher because of the greater than 50% increases that occurred after 2014.

Median values in cfu/100 ml	10-year target	Number of sites
< 100 (complaint with long-term target)		19
> 100 to 200	100 to 160	16
> 200 to 400	160 to 320	18
> 400 to 600	320 to 480	12
> 800		4

[134] Water clarity is defined in PC1 as the 10th percentile of water clarity measurements which means that measurements will need to exceed (i.e. be better than) the numerical values in PC1 at least 90% of the time in order to meet the target. Dr Ausseil expressed concern that this approach did not reflect the natural processes in a river catchment, where low water clarity is expected during high flow conditions, which typically occur more than 10% of the time. As a result, he

69 Dr Ausseil EIC, at Table 3.

considered there is a risk that the targets may not be achievable even under natural conditions.[70]

[135] Current State Attribute Bands for water clarity are stated under Table 3.11(a) as A ≥ 2.2 m, B ≥ 1.6 - <2.2 m, C ≥1.0 - <1.6 m, D ≥0.5 - <1.0 m, E <0.5 m. Except at the four sites nearest Lake Taupo, water clarity is within the D or E Bands. The following table shows Dr Ausseil's assessments of the improvements required to achieve the interim targets at the 68 monitoring sites for which data was available.

Improvement range	Number of sites
0 to 10%	15
> 10% to 20%	13
> 20% to 30%	7
> 30% to 50%	15
> 50% to 100%	12
> 100%	6

J2 Evidence relating to the reductions expected to be achieved

Nitrogen and phosphorus

[136] Dr Scarsbrook[71] referred to a NZ modelling study by McDowell *et al*,[72] which sought to identify the magnitude of contaminant reductions that might be possible before land use change would be needed. He stated:

> [116] …They estimated that if **all** available mitigation actions were implemented by 2035 the national load of N, P and sediment from pastoral land could be decreased from 2015 baseline (i.e. estimated current state) by up to 34, 39 and 66%,

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70 Dr Ausseil EIC, at [85].

71 Dr Scarsbrook EIC, at [116].

72 R McDowell, R Monaghan, C Smith, A Manderson, L Basher, D Burger, S Laurenson, P Pletnyakov, R Spiekermann & C Depree "Quantifying contaminant losses to water from pastoral land uses in New Zealand III. What could be achieved by 2035?" (2021) 64(3) New Zealand Journal of Agricultural Research 390.

> respectively. This represents the maximum level of mitigation. In reality, not all mitigations would be considered effective in all catchments.

[137] The Court is familiar with the McDowell *et al.* paper and with its companion paper by Monaghan *et al.*[73] We placed no reliance on the estimated removals cited by Dr Scarsbrook as they are based on the implementation of both established and developing mitigations considered in the McDowell paper. These may or may not be practicable and/or implemented in the Waikato region. Instead, we relied of the estimates in the Monaghan paper.

[138] The Monaghan paper analysed established mitigation and management practices that the authors considered had (i) been broadly accepted as good management practices[74] or (ii) been implemented to some degree by the farming community. The measures were documented in their Table 1, with assumed implementation of some in 1995 and others in 2015. The paper then noted that "A companion paper (McDowell et al. 2020 (*sic*)) will focus on the potential of the full implementation of established and other, developing, measures that could in the future further mitigate farming's impacts on water quality". We note that paper was dated 2021 and the 2015 and 2035 dates refer to when the mitigations were considered to be good management practices, not when they were implemented.

[139] The McDowell paper built on that of Monaghan and both papers addressed the complexities involved in predicting the extent to which different mitigations have been implemented, will be in the future and what contaminant reductions they will achieved by when. We note the following extracts from the McDowell paper:[75]

> Given the diversity of landforms and climate, land use and practices vary considerably, resulting in a wide range of contaminant loss profiles …although dairy farms are generally considered to have higher yields of nutrient loss relative to other land use types, a summary of yields determined from catchments from c.1975 to

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73 R Monaghan, A Manderson, L Basher, R Spiekermann, J Dymond, C Smith, R Muirhead, D Burger & R McDowell (2021) Quantifying contaminant losses to water from pastoral landuses in New Zealand II. The effects of some farm mitigation actions over the past two decades, New Zealand Journal of Agricultural Research, 64:3, 365-89, DOI: 10.1080/00288233.2021.1876741.

74 e.g. https://www.dairynz.co.nz/ environment/ and https://beeflambnz.com/compliance/environment

75 at pages 2, 3 and 6.

> 2007 found that P losses for dairy farms could be both greater and lesser than drystock farms. …The aim of this study was to estimate the maximum load (kg) of contaminants that could be mitigated from current pastoral land uses if current (i.e. established) mitigation actions had been implemented, where suitable, by 2015. …
>
> …
>
> This paper is a desktop, national scale analysis that makes many assumptions.
>
> …
>
> Developing actions have been less widely accepted and implemented by the farming community because their cost and effectiveness have only been established in a handful of cases and national cost-effectiveness has yet to be established. We contend that full implementation of established and developing actions (where applicable) will play an important role in mitigating contaminant losses to water from farms over the next two decades of New Zealand agriculture.

[140] The conclusions in the McDowell paper were:[76]

> If all current established mitigation actions had been implemented by 2015, the potential percentage decreases in national loads of N and P would have been 16 and 23%, respectively. A greater proportion of this could have been achieved from land under dairying (34% for N and 26% for P) because of its greater per hectare yield and the number of mitigation actions available. If all developing mitigation actions were implemented by 2035 the national load of N, P and sediment from pastoral land could be decreased from 2015 baseline (i.e. estimated current state) by 34, 39 and 66%, respectively. …

[141] National studies of this nature do not form an acceptable basis for decision-making in relation to PC1 without understanding them in a local context, particularly in view of the cautions stated in the studies.

[142] Dr Scarsborough referred to a case study to assess the effectiveness of farm plans from 2012-2015. 700 dairy farms in the Upper Waikato FMU were supported through development and implementation of Sustainable Milk Plans. Results indicated an average 8% (range 0-49%) reduction in N and 16% (range 0-63%) reduction in P. The study found:[77]

> …Actions around wintering strategies and improved feed management had large impacts on reducing nitrogen losses on some farms (>30 % farm N reduction). The

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76 At page 16.

77 Dr Scarsbrook EIC, at [170].

> largest reductions in P (>50%) were associated with riparian management plus improved management of critical source areas, stock exclusion and dairy effluent-nutrient application.

[143] Mr Wright-Stow stated that:[78]

> … FEPs delivered on dairy farms at catchment-scale, that are supported by one-on-one advice and follow up, have been demonstrated to reduce nitrogen and phosphorus by 8% and 21% respectively, in one study, and improve two thirds of contaminant concentrations in another – all without consents.

Sediment

[144] Dr Ausseil stated that:

> [83] … In the Waikato River mainstem, water clarity is driven by a mix of suspended fine sediment and planktonic algae (itself driven by TN and TP concentrations in the river's mainstem). Meeting the water clarity TAS in the Waikato River mainstem will therefore depend on reducing both the sources of sediment and nutrients in the catchment above each monitoring point.
>
> [87] …I note that some of these improvements are very high (requiring several-fold improvement in water clarity), and I have not seen a detailed assessment of the corresponding reductions in sediment loads or of their achievability.
>
> [133] Note that a relative improvement in water clarity does not necessarily equate to an equivalent reduction in sediment loads. …

[145] He stated that: [79]

> Modelling was undertaken by WRC to test whether the policy mix of PC1 decision version may meet the in-river water quality targets. Because of the way some assumptions are built in the model, the model outputs should be seen as what is feasible rather than what will likely happen as a result of PC1. More importantly, I have reservations about the model water clarity and *E. coli* predictions as these seem overly optimistic. It is possible these originate from the assumptions made in the model about the farm scale efficacy of mitigation actions, and I recommend these should be reviewed.

[146] The modelling was undertaken by Dr Olubode-Awosola and was based on original modelling by Dr Doole, which was undertaken approximately 10 years ago based on data for a 2012 baseline year. Dr Olubode-Awosola's report titled

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78 Mr Wright-Stow EIC, at [1.4].
79 Dr Ausseil EIC, at [29].

"Waikato Regional Council Technical Report 2020/11 - Evaluation of the Decision Version of the Proposed Plan Change 1 policy mix", was attached to his evidence-in-chief. In relation to the interim water clarity targets, the report stated that most of the 10th percentile water clarity target attribute states were met with three shortfalls in the Lower Waikato FMU and one in the Middle Waikato FMU shows a shortfall.

[147] The summary of instances where target attribute states were met or breached in Table 4 of the report showed 50 sub-catchments where the target was met and 22 where it was not. It also showed that for sub-catchments where the target attribute states were breached, 28 were with a shortfall from target attribute states. Table B2 showed that most interim targets were met and exceeded by large percentages, often by more than 40% and many substantially more.

[148] We expressed concerns about assumptions used in the modelling in the Interim Decision.[80] The above summary of differing statements based on a plain reading of the modelling report reinforced our concerns about the modelling in general. Taking these and the concerns were raised by Dr Ausseil and Dr Chrystal into account, we were unable to place any reliance on the modelled predictions of improvements in water clarity.

[149] We received no other evidence that addressed the extent to which sediment reductions that would be achieved by the PC1 provisions.

E. coli

[150] Dr Ausseil raised similar concerns about modelled predictions of reductions in *E. coli* concentrations that would be achieved and we again share his concerns and did not place any reliance on the predictions.

[151] As noted in Part G2, WRC monitoring showed there was a 60 to 70% increase in *E. coli* concentrations between 2010 and 2019. However, we received no

80 At [610] and [1149].

locality-specific evidence to assist our understanding of the extent to which *E. coli* reductions are likely to be achieved by the by the PC1 provisions.

Part K Our evaluation of reductions in contaminants likely to be achieved by PC1 mitigations and likely timeframes before they start to reach receiving environments

K1 Introduction

[152] Section 70(3)(c) requires us to be satisfied that the permitted activity standards, or those standards in combination with any other provisions in the plan, will contribute to a reduction of the s 70(s) effects over a period of 10 years. Accordingly, our evaluation considers the reductions in contaminant discharges likely by achieved by permitted and consented activities in combination.

K2 Key objectives and policies

[153] Objectives 1 and 2 of PC1 are:

> **Objective 1/Te Whāinga 1**
>
> In relation to the effects of nitrogen, phosphorus, sediment and microbial pathogens on water quality, the health and wellbeing of the Waikato and Waipā Rivers, including all tributaries, springs, lakes and wetlands, other than treatment wetlands, within their catchments, are both restored over time and protected, with the result that in particular, they are safe for people to swim in and take food from, and the 80-year target attribute states in Table 3.11-1 are achieved, at the latest by 2096.
>
> **Objective 2 (Freshwater Objective)/Te Whāinga 2**
>
> Progress is made over the life of this Plan towards the restoration and protection of the health and wellbeing of the Waikato and Waipā River catchments in relation to nitrogen, phosphorus, sediment and microbial pathogens by the interim target attribute states in Table 3.11-1 being met no later than 10 years after Chapter 3.11 of this Plan is operative.

[154] To contribute to Objective 1 and give effect to s 70(3), we must be satisfied that the provisions will make a contribution to a reduction in s 70(3) effects within the PC1 area as a whole within 10 years, compared to the effects that are currently occurring. The aspirational timeframe for achieving Objective 1 is 80 years. Section 70(3) does not require there to be reduction in effects in all individual water bodies or types of water bodies or that there is a reduction in effects on all individual species of aquatic life. There is no practical way that could be assessed,

predicted or demonstrated and in our view is neither a realistic expectation nor a requirement of s 70(3). In this Part we evaluate the extent to which different provisions will reduce discharges of the primary contaminants, which is the prerequisite before assessing whether there will be reduction in the s 70(3) effects

[155] Policy 2(B)(a) in WRC's Final Proposal dated 1 December 2025 is:

> Enabling, as permitted activities, farming with a low risk of diffuse discharges of nitrogen, phosphorus, sediment and microbial pathogens to water, and requiring those activities to:
>
> i. comply with minimum farming standards in Schedule C; and
>
> ii. demonstrate through an FEP, in accordance with Policy 4, that either the risk of diffuse discharges to water is already as low as practicable given the current land use or will be reduced to be as low as practicable within 10 years of becoming operative; …

[156] The rest of Policy 2 sets out a comprehensive list of matters to be considered in relation to farms with more than a low risk of diffuse discharges and require resource consents, which we summarised in Part B3 and address further below.

[157] Policy 3 requires CVP activities to obtain a resource consent, to adopt good management practices and for the FEP to demonstrate how the risk of diffuse discharges of the primary contaminants will be managed. For expansion of CVP activities to be authorised, there must be no material increase in the risk of diffuse discharges of the primary contaminants associated with the grower's existing and expanded activities (in combination) relative to what would have occurred on the land under the land use to be displaced by new CVP. As footnoted in Part B3, Policy 2(B)(b) applies to CVP and requires demonstration through an FEP that either the risk of diffuse discharges to water is already as low as practicable given the current land use or will be reduced to be as low as practicable within 10 years of becoming operative.

[158] Policy 4 sets out requirements for the preparation of farm environment plans (**FEPs**), which we return to below.

[159] Policy 10 is:

> **Policy 10/Te Kaupapa Here 10**
>
> Prepare for further diffuse discharge reductions and any future management regime (including potentially the allocation of diffuse discharges of contaminants) in subsequent regional plans by collecting information and undertaking research including, but not limited to, collecting information about current discharges, developing appropriate modelling and other tools to estimate contaminant discharges, and researching the spatial variability of land use, biophysical risk factors, contaminant losses and the effect of contaminant discharges in different parts of the catchment including sensitive receiving environments, to assist in the design of any future management regime

K3 What is meant by "standards" in s 70(3) and do the permitted activity provisions of the Plan fit within that meaning?

[160] The term "standard" is not defined in the RMA, the Regional Policy Statement, the Plan or the NPSFM. The Collins Concise Dictionary definition of "standard" includes "an accepted or approved example of something against which others are judged or measured".[81] The Cambridge Dictionary defines standard as "a level of quality". Standards New Zealand describes standards as agreed specifications for certification and performance requirements. WorkSafe[82] describes standards as establishing specifications to ensure certain outcomes.

[161] The permitted activity rules and conditions in the Plan specify limits to be met and we are satisfied that they meet the above definitions of standards for the purposes of the s 70 test. In addition, Schedule D1 of the Plan describes the requirements for FEPs for permitted activities, which include demonstration of compliance with specific standards. FEPs are a regulatory requirement of the Plan, not a non-statutory document that sits to the side of the Plan. Based on the above, we are satisfied that the permitted activity conditions and other provisions of the Plan are standards for the purposes of the s 70 test.

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81 *Collins Concise Dictionary – 21st Century Edition* (5th ed, HarperCollins Publishers, Glasgow, 2001).

82 *Referring to standards in regulation and guidance*, WorkSafe | Mahi Haumaru Aotearoa, June 2019.

K4 Relevant permitted activity rules

[162] PC1 includes three permitted activity rules relating to farming activities:

Rule 3.11.4.1 Permitted Activity Rule – Small and very low risk farming

Rule 3.11.4.2 Interim Permitted Activity Rule – Farming prior to obtaining consent

Rule 3.11.4.3 Permitted Activity Rule – Farming with a low risk of diffuse discharges.

[163] We are satisfied that any discharges of the four primary contaminants from very low risk farming activities in accordance with Rule 3.11.4.1 will be sufficiently minor to be inconsequential for the purposes of our evaluation. Rule 3.11.4.2 applies only until an activity requiring consent is granted consent and requires the activity to comply with minimum farming standards. On that basis, we are satisfied that it will be the most appropriate way to achieve the objectives of PC1 on an interim basis and will contribute to a reduction in s 70(3) effects during that time, albeit of minimal significance.

[164] Rule 3.11.4.3 is a hybrid rule that authorises both farming land use and the associated diffuse discharge of the primary contaminants and is the focus of our evaluation. The Rule itself sets limits for dry stock numbers and maximum allowable Nitrogen Risk Scorecard values for dairy farms. It requires compliance with minimum farming standards in Schedule C and implementation of a FEP prepared in accordance with Schedule D1 and which must be independently certified and audited. It must be provided to WRC within 20 working days of a request by WRC being made. Full electronic access to the risk assessment must be made if requested by WRC. The Certifier must advise WRC once the FEP has been certified.

K5 The requirements of Schedules C and D1

[165] The minimum farming standards in Schedule C require or set:

(a) Within 10 years, where stock are required to be excluded, they must be excluded from any permanently or intermittently flowing river (including any spring, stream and modified river or stream) or permanently or intermittently flowing artificial watercourse; and from any lake; and from any natural wetland that supports a population of threatened species.

(b) Water bodies must be fenced where any paddock adjoining the water body is used for break feeding, grazing on annual forage crops, grazing on pasture that has been irrigated with water in the previous 12 months and any paddocks with a slope of up to and including 15 degrees, unless identified in a certified FEP as being impractical.

(c) New fencing is to be located at specified distances from water bodies and are equal to or exceed the requirements of the Resource Management (Stock Exclusion) Regulations 2020.

(d) No cultivation shall occur within 5 m of any waterbody.

(e) Limits on fertiliser application.

[166] Failure to comply with Schedule C will result in a farm requiring consent immediately (*and not as specified in Table 3.11-3*).[83]

[167] Schedule D1 requires FEPs for permitted activities to:

(a) Demonstrate general improvement in farming practice to reduce the risk of diffuse discharges of the four primary contaminants except where such discharges are already as low as practicable and to require five yearly reporting to demonstrate that progress has been made.

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83 Note to Rule 3.11.4.2.

(b) Prioritise actions that reduce those contaminant(s) of most concern in the sub-catchment and of highest risk of diffuse discharge from the farm.

(c) Demonstrate compliance with minimum standards for nutrient management, minimising sediment loss from critical source areas as soon as possible and managing farm scale erosion.

(d) Ensure that no more than five ha of intensive winter grazing on a farm occurs on land over 10° slope, that no intensive winter grazing occurs on land over 20° slope and that sacrifice paddocks and intensive winter grazing include a 10-metre wide vegetated strip from defined water bodies.

(e) Specify requirements for managing races, lanes, raceways and other infrastructure, and irrigation and effluent management.

(f) Include a programme to undertake and complete the stock exclusion requirements (including fencing) in Schedule C.

K6 Relevant provisions for activities that require resource consents to discharge the four primary contaminants

[168] Section 70(3) requires the Court to be satisfied that the permitted activity standards, or those standards in combination with any other provisions in the plan, will contribute to a reduction of s 70(3) effects over a period of 10 years. Other relevant provisions in PC1 include Policies 2B, subclauses b to h, 3, 3A, 4, 5, 7, 9 and 11, to 18. Policy 2 is the key policy for the purposes of our evaluation and was substantially rewritten through an iterative and inclusive process in which appellant parties had the opportunity to participate in accordance with Court directions set out in a minute dated 30 July October 2024.

[169] We are satisfied that all of the above policies are the most appropriate to meet the objectives of PC1 in accordance with the requirements of s 32 and 32AA of the RMA and that any further amendments would not result in any material increase in the extent to which the s 70(3) effects are reduced within 10 years.

[170] The relevant Rules applying to consented activities are:

> Rule 3.11.4.4 Controlled Activity Rule – Farming with more than a low risk of diffuse discharges and low risk farming where stock exclusion requirements cannot be met
>
> Rule 3.11.4.5 Controlled Activity Rule – Existing commercial vegetable production
>
> Rule 3.11.4.6 Restricted Discretionary Activity Rule – Farming in Whangamarino Wetland catchment
>
> Rule 3.11.4.7 Discretionary Activity Rule – Farming not otherwise regulated by any other Chapter
>
> Rule 3.11.4.8 Discretionary Activity Rule – Commercial vegetable production expansion
>
> Rule 3.11.4.9 Non-Complying Activity Rule – Land use change
>
> Rule 3.11.4.10 Restricted Discretionary Activity Rule – Land use change and farming on tangata whenua ancestral lands

[171] These rules also were tested extensively through both the Council hearing and subsequent appeals process and, again, we are satisfied that all of the above provisions are the most appropriate to meet the objectives of PC1. We are also satisfied that further amendments to any of the PC1 provisions would not result in any material increase in the extent to which the s 70(3) effects would be reduced

within 10 years and would delay PC1 becoming implemented by at least a year and potentially much longer.

[172] The rule requirements are extensive and we do not summarise them except to note the following:

(a) For farming activities with more than a low risk of diffuse discharges, compliance with the minimum farming standards in Schedule C.

(b) For those farming activities and existing commercial vegetable production, preparation of FEPs in accordance with Schedule D2, which includes requirements additional to those in Schedule D1 to reflect the increased level of risk of diffuse discharges.

(c) Any change in land use is a non-complying activity, except for a limited area of Tangata Whenua Ancestral Land.

[173] CVP activities are to be managed in accordance with the requirements of Policy 3, which are set out in Part K2 and Rules 3.11.4.5 and 3.11.4.8. Under controlled activity Rule 3.11.4.5, one matter over which WRC reserves control in relation to existing CVP is measures to ensure the risks of diffuse discharges of the primary contaminants is as low as practicable or will be reduced to be as low as practicable over an appropriate specified period. Expansion of CVP is discretionary activity under Rule 3.11.4.8, with discharges managed in accordance with Policy 3.

K7 Requirements for certifying and auditing FEPs

[174] All FEPs for both permitted and consented activities must be certified and audited by a CFEP, who is a person who has been approved by the Chief Executive of WRC as meeting the requirements described in Schedule D4.

[175] Rule 3.11.4.3 requires FEPs for activities permitted under the Rule to be submitted for certification to a CFEP by the Relevant Date in Table 3.11-2, and to be certified within a further six months. Rules relating to consented activities require

consent applications and FEPs to be provided to WRC by the Relevant Date in Table 3.11-2. Based on the timeframes in Schedule D4, FEPs would be certified within six months, even if a second CFEP was engaged by a farmer. As a general rule, we would expect resource consents to be processed within six months.

[176] Relevant dates in the table start at one year after PC1 is made operative for sub-catchments with higher priority for restoration to five years for sub-catchments with less priority. This means that the first tranche of FEPS will be certified approximately 18 months after PC1 becomes operative. For the purposes of our evaluation, we have adopted a median Relevant Date of three years. This means that the median date by which all FEPs for permitted activities should be certified and consents for other activities should be granted is indicatively three and a half years after PC1 becomes operative.

[177] We consider that the requirements of Table 3.11-2 provide appropriate timeframes to enable farmers to understand the new regulatory framework, prepare FEPs in accordance with them and for sufficient appropriately skilled and knowledgeable CFEPs to be available to support them. We also consider that attempting to shorten the timeframes would prejudice longer-term environmental outcomes.

[178] While FEPs for permitted activities are only required to be submitted to WRC on request, the CFEP is required to notify WRC when each FEP has been certified, enabling it to ensure farms have a certified FEP in place.

[179] All FEPs must be audited not later than 12 months after the initial certification and the auditor must provide a copy of the audit report to WRC within five working days of completing an audit. This will ensure WRC is made aware of any non-compliances with the FEPs and any relevant plan provisions.

[180] Recertification of FEPs is required at five-yearly intervals unless otherwise specified in a resource consent. Further audits are required at three-yearly intervals with a provision for the interval to be extend to five years after two consecutive audits demonstrate full adherence with the action plan in the FEP.

K8 Timeframes for implementation of FEPs and times by which reductions in diffuse discharges are likely to occur

[181] The Plan does not set timeframes for implementation. However, both Schedules D1 and D2 require FEPs to prioritise actions that reduce those contaminant(s) of most concern in the sub-catchment and of highest risk of diffuse discharge from the farm and to recognise the particular vulnerability of lakes. Schedule D1 requires FEPs for permitted activities to demonstrate general improvement in farming practice to reduce the risk of diffuse discharges except where such discharges are already as low as practicable, to contribute to the achievement of the target attribute states in Table 3.11-1, and to require five yearly reporting to demonstrate that progress has been made.

[182] Schedule D2 for consented activities requires FEPs to demonstrate general improvement in farming and growing practice to reduce the risk of diffuse discharges of the primary contaminants to contribute to the achievement of the target attribute states in Table 3.11-1. Policy 2(B)(c)(vii) relating to dairy farms with more than a low risk of diffuse discharges of the primary contaminants requires "good management practices and mitigation measures to be recorded in FEPs and implemented as soon as practicable and prioritised so that those predicted to be most effective in reducing the risk of diffuse discharges to be set out as a condition of consent and completed within the first five years of the consent, with steady progress over time".

[183] We are satisfied that these provisions are the most appropriate to ensure that mitigations are implemented as soon as practicable but as noted in Part B3, WRC will need to provide clear guidelines to guide farmers, their advisors, CFEP and Consent Officers to ensure consistency of approach as far as possible. WRC's certification process must require that its approved CFEPs ensure these requirements are reflected in the FEPs and that audit processes ensure they are being implemented.

[184] Subject to those qualifications, we are satisfied that in addition to mitigations already implemented, implementation of further mitigations can reasonably be

expected to be underway within a year of certification in most cases, is likely to already be underway in some and there will be some who will be resistant to change. WRC will need to have procedures in place to identify and remedy any non-compliance. As noted above, failure to comply with Schedule C will result in a farm requiring consent immediately, and not as specified in Table 3.11-2. This could become an important lever for WRC. We also consider that the PC1 requirement for all FEPs to be independently certified and audited, whether activities are permitted or require consent, provides an important safeguard towards ensuring the efficiency and effectiveness of FEPs.

[185] We are satisfied that, provided the requirements of the Plan are adhered to, which we must assume will be the case, implementation of the first tranche of new mitigations will start within about three years of PC1 becoming operative and reduced contaminant discharges can reasonably be expected to start reaching receiving environments within a further year. The majority of FEPs will be underway, indicatively, within five years of PC1 becoming operative. For the reasons set out under the next sub-heading, we are satisfied that some farmers are already adopting a range of good management practices.

K9 Extent to which good management practices have already been adopted in the PC1 area

[186] We stated in the Interim Decision that:

> [312] Fonterra, HortNZ and no doubt other industry organisations, have instigated a range of improved management programmes over the last few years independent of the national and regional planning framework. The Fonterra Risk Scorecard Manual describes the Nitrogen Management Programme as running since the 2012/13 season and it formed part of Fonterra's commitments under the Sustainable Dairying: Water Accord. We describe some of HortNZ's initiatives relating to management improvements in Part F9.
>
> [313] These programmes and the farming evidence before us indicate that there are those within the farming community who understand and accept the need for improved management practises that reduce contaminant discharges and there is good work being done by leaders in the field. By way of example, it was estimated that by 2017 61% of all streams on dairy and drystock farms had been fenced in accordance with the Stock Exclusion Regulations.
>
> Footnotes omitted

[187] Mr Wright-Stow stated that 67% of dairy farms in the wider Waikato region had FEPs as of December 2022 and the dairy companies have agreed that all farmers will have them by 2025. He also stated that stock had been excluded on dairy farms from 98% of large waterways (>1m wide, >30cm deep).[84] The Court is aware that stock exclusion under the Dairying and Clean Streams Accord has been underway for approximately 15 years. Tables 5 and 7 in the Interim Decision, which were based on expert conferencing, indicate that out of a total length of around 10,000 km of Strahler Order 1 to 6 streams on dairy land, around 20% remained to be fenced based on what we understand to be a 2017 survey. Allowing for continuing progress to have been achieved since 2017, the Mr Wright-Stow's 98% figure appears reasonable and we accept it.

[188] As discussed in Part J2, Dr Scarsbrook referred to the Sustainable Land Use Initiative in which 700 dairy farms in the Upper Waikato FMU were supported through development and implementation of Sustainable Milk Plans from 2012 to 2015. Results indicated an average 8% (range 0-49%) reduction in N and 16% in phosphorus. Mr Wright-Stow provided the following further background:

> [5.23](c) The Sustainable Land Use Initiative supported farmers to complete ~700 whole farm plans and collectively achieved 14 million trees planted over 500,000 ha. 570,000 m of waterways were fenced. The initiative was predicted to have reduced sediment load from 3.1 M to 1.6 M ha once trees reach maturity

[189] This clearly illustrates what can be and has been achieved in 700 of the 2,000 or so dairy farms in the region, and which we anticipate is largely continuing to be achieved. Our detailed review of evidence indicates that much longer than 10 years will be required before the benefits of some mitigations will be effective in receiving environments, independent of whether farming activities are permitted or require consents.

[190] The Council Hearing Panel heard evidence of unsatisfactory levels of compliance with the existing permitted activity rule governing effluent irrigation

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84 Mr Wright-Stow EIC, from [5.6.]

from farming activities.[85] We understand and accept from Dr Scarsbrook's evidence that significant improvements in riparian management and dairy effluent disposal practices occurred between the baseline monitoring period of 2010 to 2014 and the period 2018 to 2022.[86]

[191] Based on the above evidence we are satisfied that a number of mitigations that are required by PC1 have been in place for at least 10 years in some cases.

K10 Farmer attitudes to FEPs

[192] The evidence before the Court in relation to PC1 and on numerous similar cases is that farmer attitudes will be important in terms of their commitment to adopting good management practices. Mr McGiven, a dairy farmer and former Waikato Federated Farmers President, stated that "PC1 is the most challenging change in regional policy for our members in the Waikato region to date".[87]

[193] We stated in the Interim Decision:

> [318] By any yardstick, the challenges in restoring and protecting the Waikato and Waipā River catchments are immense and we agree with Mr Pinnell that the best outcomes will be achieved if the two disparate world views come closer together and parties work collaboratively. While we understand the desire to fix the problem(s), we consider that by setting more stringent rules as part of PC1, the outcome could be to seriously delay progress if unachievable short-term targets are set.

[194] Mr Wright-Stow stated:

> [5.32] Based on my attendance at industry initiatives and farmer meetings, I observe that landowners recognise that improvements need to be undertaken. In particular, I note that farmers want clarity and certainty, combined with flexibility that supports innovation and ownership. To ensure that this vital investment and focus on freshwater outcomes continues, I consider landowners need certainty that their investments are recognised and supported by Council and markets.
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> [5.33] This idea of flexibility is at the core of empowering farmers to 'own' actions and innovation to achieve better outcomes for water quality. …

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85 Recommendation Report, at [1110].
86 Dr Scarsbrook EIC, at [99].
87 Mr McGiven EIC, at [45].

[195] The Court acknowledges that the response of the farming and growing communities to PC1 will be key to its success. We have emphasised the importance of the plan requirements recognising the need for practicality and affordability and we are satisfied that the provisions provide flexibility to enable mitigations to be implemented that are the most appropriate for each individual activity. Ultimately, success will come down to the reasonableness with which those involved work together and that cannot be mandated in any planning document.

K11 What reductions in the discharges of the primary contaminants are the PC1 provisions likely to achieve over what timeframes?

[196] Dr Scarsbrook considered that the most effective mitigations are stock exclusion from waterways, improved filtering capacity of riparian areas, continued improvements in farm dairy effluent management and actions to reduce losses from critical sources areas (for example, tracks and races).[88] That is consistent with the Court's understanding from other PC1 evidence and other similar cases and we accept it as the basis of our evaluation.

[197] We referred to research papers by Monaghan *et al* and McDowell *et al* in Part J2, which were cited by Ms McArthur, Dr Scarsbrook and Dr Depree and, as noted above, the Court is familiar with both papers. The McDowell paper assessed the effectiveness of key measures such as those identified above by Dr Scarsbrook. As also noted in Part J2, national studies of this nature do not form an acceptable basis for decision-making in relation to PC1 without understanding them in a local context.

[198] Significant work would be required to compare the implementation of different mitigation measures in the PC1 area with those assumed in Table 1 of the Monaghan paper. However, having reviewed the methodology adopted by Monaghan and from a high-level review of the table, and based on our understanding of the PC1 evidence in general, we consider that while the assumed

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88 Dr Scarsbrook EIC, at [141].

2015 implementation rates of different mitigations appear optimistic, they do not appear to be unreasonable in 2025.

Nitrogen

[199] In relation to nitrogen, we observe that the 16% reduction in losses in the Monaghan paper is within a general range we consider can reasonably be achieved using an appropriate range of good management practices, based on other cases heard by the Court. As noted above, an 8% reduction in nitrogen losses occurred as a result of the Sustainable Land Use Initiative. Our expectation is that the percentage will increase in response to the PC1 provisions and in any event will exceed the approximately 7% reduction required to meet the interim water quality target based on Dr Ausseil's evidence.

[200] In view of the Sustainable Land Use Initiative and the improvements in dairy effluent management referred to by Dr Scarsbrook, we consider it reasonable to expect a significant proportion of the 7% reduction is currently being achieved on at least a third of dairy farm and probably more.

Phosphorus

[201] In relation to phosphorus, Monaghan estimated a 23% reduction based on established mitigations. A 16% reduction in phosphorus losses occurred as a result of the Sustainable Land Use Initiative and, again, our expectation is that the percentage will increase in response to the PC1 provisions and in any event will exceed the 11.5% reduction required to meet the interim water quality target based on Dr Ausseil's evidence. As in the case of nitrogen, in view of the Sustainable Land Use Initiative and improvements in phosphorus, we consider it reasonable to expect a significant proportion of the 11.5% reduction is currently being achieved on at least a third of dairy farm and probably more.

Sediment

[202] Sediment removal will vary widely depending on local circumstances and we received limited evidence that assisted us to assess the extent of removal that can be

expected as a result of the PC1 provisions. WRC's modelling adopted 70% as the efficacy of farm plans for sediment removal.[89] This was questioned by both Dr Ausseil and Dr Chrystal and we agree that such a large reduction would require much more detailed supporting evidence before we could rely on it.

[203] We followed up a reference he may have relied on that cited[90] references for sediment removal from streams as ranging broadly from 20 to 50% for fencing out cattle. We found no reference to 70% removal but Dr Chrystal identified pole (or space) planting as a good example and of a key management in achieving 70% reductions in sediment loss. This involves planting young trees between one and three metres high on erosion prone slopes. The Monaghan Report gives the same example for the purposes of removing erosion from hill slopes. We do not rely on this being a mitigation option that will achieve significant reductions in sediment loss within the 10-year term of PC, but it could well be longer-term.

[204] Despite this lack of definitive numbers, we are satisfied that the PC1 provisions will result in reductions in sediment discharges that, whatever the actual number is, will be critical as a first step in restoring the Waikato River system. Taking into account mitigations already implemented that are necessary to satisfy the PC1 provisions, the reductions will result from significantly improved management of critical source areas, intensive winter grazing and sacrifice paddocks, including 10 metre buffer strips, reduced stream bank erosion and increased controls on new and existing races, laneways and other farm infrastructure.

[205] We do not consider it necessary or that it would be possible to quantify what extent of reduction will be achieved, but we are satisfied that it will be enough to contribute a to reduction in the 70(3) effects within 10 years. We are satisfied also that the reductions will start to reach receiving environments relatively quickly after

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89 Dr Olubode-Awosola EIC, Table A2.

90 https://www.waikatoregion.govt.nz/council/policy-and-plans/healthy-rivers-plan-for-change/technical-alliance/technical-alliance-documents/. Description of mitigation options defined within the economic model for Healthy Rivers Wai Ora Project.

mitigations are implemented (within a year) because of their locations alongside receiving environments.

E. coli

[206] Dr Depree's evidence is that stock exclusion has been modelled in PC1 to reduce *E. coli* by 58-65% on dairy and drystock farms.[91] Based on Dr Olubode-Awosola's reference, median *E. coli* concentrations can be reduced indicatively by 20 to 65% by stream bank fencing. We received other evidence that referred to studies showing a greater range of removals of *E. coli* as a result of stock exclusion but which, without reference to how that are relevant to PC1, can be given little weight. We received no evidence on overall reductions expected to be achieved by the PC1 provisions.

[207] Despite this lack of definitive numbers, and for the same reasons summarised above in relation to sediment, we are satisfied that the PC1 provisions will result in reductions in *E. coli* discharges that will provide the foundation for the longer-term achievement of Te Ture Whaimana. As for sediment, we do not consider it necessary or that it would be possible to quantify what extent of reduction will be achieved, but we are satisfied that it will be enough to contribute a to reduction in the 70(3) effects within 10 years. We are satisfied also that the reductions should start to reach receiving environments relatively quickly after many mitigations are implemented because of their locations alongside receiving environments.

K12 Time before nitrogen and phosphorus reductions will start to reach receiving environments

[208] A relatively small but unquantifiable reduction will already be reaching receiving environments as a result of stock being excluded from water bodies and improvements in dairy effluent management. A somewhat greater proportional

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91 Dr Depree EIC, at [6.27].

reduction in phosphorus will already be occurring as a result of its partial attachment to sediment removed as discussed above.

[209] The majority of the two nutrients will reach receiving environments via groundwater, which we discussed in Part H1. Our key finding in relation to nitrogen was:

> Indicatively, the benefits of reduced discharges of nitrogen from both earlier and new mitigation measures can reasonably be expected to have reached some receiving environments now in a small way and almost certainly within about three to four years of PC1 becoming operative and will progressively increase through the term of PC1.

[210] We received no evidence relating to phosphorus travel times in groundwater and have worked on the basis that being in the dissolved reactive form, it will the same as that of nitrogen.

K13 Reconciling the above findings with what has been observed in receiving environments

[211] As summarised in Part D2, WRC's 2022 SOE Report recorded that:

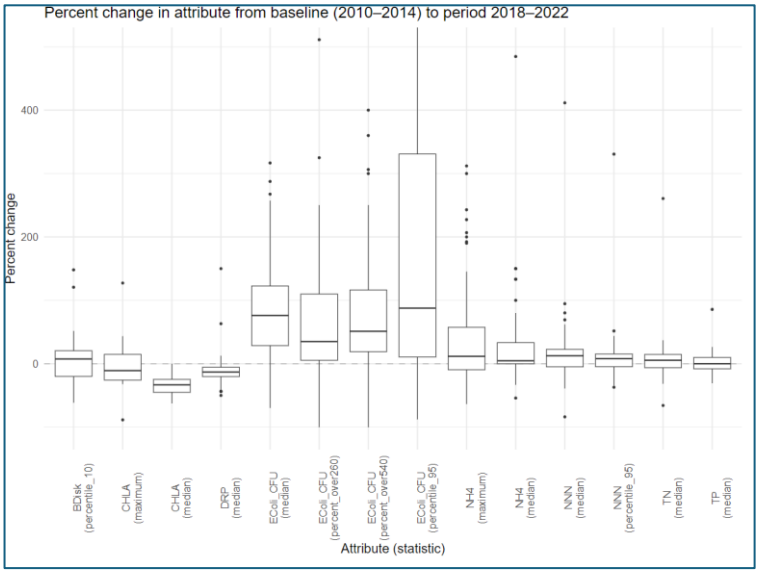
(a) diffuse nitrogen has continued to worsen in many waterbodies and conversely, nitrogen concentrations have decreased in some areas where dairy farming is long established;

(b) there are several lines of evidence supporting a real reduction in phosphorus;

(c) We did not detect widespread declines in sediment in rivers; and

(d) Bacteria are transported with fine sediment, and both sediment and bacteria remain at high levels in many rivers.

[212] The following graph of monitoring results reproduced from Dr Scarsbrook's evidence illustrates the changes.



[213] There is no inconsistency between our finding that a small reduction in phosphorus should be reaching some receiving environments and WRC's 2022 SOE Report.

[214] An apparent inconsistency could be seen between our finding that a small reduction in nitrogen should be reaching some receiving environments and what the monitoring shows. As noted in Part H1, it is likely that some increased nitrogen load resulting from increased dairy cattle numbers in the period through to 2014 in some other parts of the PC1 area could reach receiving environments in the first few years after PC1 becomes operative.

[215] In addition, as recorded in Attachment 1, Part E2, NIWA noted that climate cycles can affect trend analyses. Other experts also identified climate change and climate cycles as needing consideration, as did the Environment Court in relation to the Te Waikoropupū Springs Water Conservation discussed in Part I. We consider it likely that climate variations and climate cycles are at play in the PC1 area and that, whatever the specific scientific explanation, nitrate concentrations can move up and down as a consequence.

[216] Further, WRC's 2022 SOE Report stated that nitrogen reductions were recorded in parts of the PC1. We are satisfied that our finding that a small reduction

in nitrogen discharges from farming activities consistent with the PC1 provisions is already reaching some receiving environments remains valid and that the increasing trends more likely than not result from remnant load to come and the effects of climate cycles.

[217] There is no conflict between our finding that a small reduction in sediment discharges from farming activities consistent with the PC1 provisions is already reaching some receiving environments and the statement in WRC's SOE Report that widespread declines in sediment in rivers were not detected. In our view, it could well be 20 or more years before statistically robust changes will be able to be demonstrated.

[218] The increase in *E. coli* concentrations is unexplained, as discussed in Parts G2 and G3.

[219] In addition to the above, Dr Ausseil drew attention to the need to consider natural variability, uncertainties and the need for caution when interpreting monitoring results, as discussed in Attachment 1, Part E1.

[220] Overall, after considering the trends recorded in WRC's 2022 SOE Report, we are satisfied that there is no reason to change any of our findings relating to when reductions in discharges of the primary contaminants start to reach receiving environments.

Part L Will there be a reduction in the s 70(3) effects within 10 years?

L1 Background to our approach

[221] The complexities of assessing effects on aquatic life are clearly stated above and in Attachment 1. We are satisfied that it will not be possible to statistically demonstrate the extent, if any, of reductions of effects on aquatic life in 10 years' time. It is more likely that it might take 20 years and possibly longer. We are also satisfied that it will not be possible to statistically demonstrate changes in effects on water clarity and the extent to which receiving waters are suitable for consumption by stock within the same timeframes. Scientific certainty and a definitive assessment of changes in s 70(3) effects are not achievable expectations.

[222] The starting point for our evaluation is that the state of degradation in parts of the PC1 area is so significant that Te Ture Whaimana acknowledges it will take 80 years, aspirationally, to restore them to health. Other parts are not degraded and most are somewhere in between. There will be parts where a small reduction in contaminant discharges will be sufficient to restore them to good health and others where progressively increased reductions will be required to do so. It is likely that the state of degradation will go up and down at times in some areas due to natural variations and local influences not associated with farming.

[223] Accordingly, our evaluation must be based on reasoned judgement, taking into account the evidence before us, relevant case law and the experience of members of the Court on cases addressing the effects of diffuse contaminant discharges on aquatic environments. Based on that evidence and experience over many years, there has been a growing recognition and acceptance by farmers and growers and their supporting organisations of the need to reduce their effects on the environment. We acknowledge that considerable progress is being made, particularly by leaders in their fields.

[224] However, the effectiveness of the PC1 provisions will be influenced significantly by the benefits and equity perceived by the farming and growing communities and the extent to which the provisions are practical and affordable.

PC1 was developed to provide flexibility to enable farm-specific solutions to be developed within a defined framework that will be most effective at reducing contaminant discharges within the term of the plan change.

L2 Our Evaluation and findings

[225] It is clear from Attachment 1, Part E that the increased levels of sediment and nutrients in large parts of the PC1 area are causing significant adverse effects on aquatic life and that elevated *E. coli* concentrations make water bodies unsuitable for drinking by stock through much of the PC1 area. While there were some differing views between experts as to which contaminants were more significant in terms of some of the effects and while multiple other sources and natural causes contribute to the adverse effects, the question for the Court is will the reductions in discharges of the four primary contaminants contribute to a reduction in the effects within 10 years of PC1 becoming operative.

[226] For the reasons stated above, we are satisfied that some reductions in the primary contaminants are already reaching some receiving environments but are currently at relatively low levels that cannot be confirmed by monitoring or modelling. The reductions in the primary contaminants discharged will gradually increase through the term of PC1 and we are satisfied that by the end of the term, the reductions in nitrogen and phosphorus leaving farms will be the same or greater than the reductions required to meet the interim attribute states, but the reductions reaching receiving environments will vary with distances from the source.

[227] In cases where groundwater travel times exceed 10 years, the full benefits will not take effect in some receiving environments within the term of PC1 and it is not possible to predict when they will occur, based on the best currently available information. Nevertheless, we are satisfied that nitrogen and phosphorus loads reaching all receiving environment will be as low as practicable within 10 years.

[228] There are no available methods to assess what reductions in adverse effects on aquatic life will result from the reduced nitrogen and phosphorus in different parts of the PC1 area. There will be time delays between when contaminant

reductions reach receiving environments and when reductions in adverse effects will first start occurring. The delays cannot be quantified and will differ depending on species and the existing state of degradation but we are satisfied that a reduction in adverse effects will start in a small way in rivers and streams where the effects are currently minor, starting part way down each sub-catchment, and will increase progressively lower down the catchment through the 10-year-term of the plan change.

[229] It will take substantially longer and likely decades before any significant reductions in adverse effects will result in the Whangamarino Wetland and eutrophic lakes where existing nutrient sinks in bottom sediment layers will result in nutrient recycling. That is a reflection of historical practices and there are no options that will change that.

[230] We are satisfied that the current PC1 provisions will reduce the s 70(3) effects to be as low as practicable across the PC1 area within 10 years. Whatever the extent of reductions achieved, they will form an essential first step toward achieving Te Ture Whaimana, which cannot be achieved without them.

[231] Existing sediment levels in receiving environments are resulting in particularly significant adverse effects on water clarity and on aquatic life. Water clarity in most receiving environments is in the D and E bands as shown on Table 3.11-1(a) of PC1. 60% of wadeable stream length is estimated to have more than 40% streambed cover, where 20% cover is a threshold above which changes in community composition can occur. Based on the evidence, highly erodible soils are a primary source of high sediment discharges and in those areas, reductions are likely to take significantly longer than the term of PC1 to become effective. Natural variations and changing climate patterns are likely to add to the difficulties of assessing the effects of reducing discharges.

[232] PC1 requires FEPs to identify erosion risks on individual farms and to identify means to manage them and can be expected to be reduced to be as low as practicable within 10 years in accordance with the overall PC1 provisions. We are satisfied there will be a reduction in the quantity of sediment discharged from

farming activities as a result the adoption of best management practices. We are also satisfied that will contribute to a reduction in adverse effects within 10 years, but that the contribution is likely to be relatively minor in most sub-catchments because of the extent of degradation already existing. That is an artifact of past land management practices and we do not consider there are any alternative provisions in PC1 that would result in better environmental outcomes.

[233] While approximately 25% of monitored sites comply with current recreational water standards, the remaining 75% do not. Approximately 25% of the sites exceed the limit by two to four times and a similar percentage of sites exceed it by four to eight times. The guideline value for water to be suitable for stock watering is more stringent than for recreational, meaning water bodies complaint for stock watering will be less than 25%. Again, this is a reality of past land use practices that PC1 can only go so far to address.

[234] As for sediment, we are satisfied there will be a reduction in *E. coli* discharged from farming activities as a result the adoption of good management practices and other plan requirements. We are also satisfied that will contribute to a reduction in adverse effects within 10 years, but the contribution is likely to be minor in most sub-catchments and will be unlikely to significantly increase the lengths of streams where water quality meets the stock watering standard. We do not consider this situation could be changed by any alternative provisions in PC1 that would result in better environmental outcomes.

[235] Our overall finding is that the permitted activity standards in combination with the other provisions of PC1 will be a contribution to a reduction in the s 70(3) effects within 10 years. In view of the extent of existing degradation of water bodies in the PC1 area, the reduction in effects will be relatively limited in extent overall and the extent of reduction will not be detectable by state of the environment monitoring because of variability due to natural and other influences. Similarly, predictive modelling will not be sufficiently accurate to quantify the reduction achieved within the term of PC1.

Part M Sections 70(2) and 32AA of the Resource Management Act

M1 Background

[236] Section 70(2) states:

> Before a regional council includes in a regional plan a rule requiring the adoption of the best practicable option to prevent or minimise any actual or likely adverse effect on the environment of any discharge of a contaminant, the regional council shall be satisfied that, having regard to—
>
> (a) the nature of the discharge and the receiving environment; and
>
> (b) other alternatives, including a rule requiring the observance of minimum standards of quality of the environment,—
>
> the inclusion of that rule in the plan is the most efficient and effective means of preventing or minimising those adverse effects on the environment.

[237] PC1 requires permitted activities to reduce diffuse discharges of the primary contaminants to be as low as practicable within 10 years of becoming operative to contribute to a reduction in s 70(3) adverse effects on the environment. Accordingly, s 70(2) applies.

[238] To date, PC1 s 32 and s 32AA evaluations were undertaken on the basis that permitted activities satisfied the requirements of the original s 70. As that was not correct and while no material changes to the provisions are proposed or considered necessary, we set out below our s 32AA evaluation, to enable us to be satisfied that our decision is consistent with all requirements of the Act. In addition to the consideration of alternatives required by s 70(2)(b), s 32AA(2) requires us to:

> (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
>
> (i) economic growth that are anticipated to be provided or reduced; and
>
> (ii) employment that are anticipated to be provided or reduced; and

(b) if practicable, quantify the benefits and costs referred to in paragraph (a); and

(c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

[239] The alternatives to be considered are whether farming activities with a low risk of diffuse discharges should be permitted activities or require a resource consent.

M2 Number of farming activities affected

[240] As stated in the Interim Decision,[92] Mr Sinclair estimated there could be between 2,200 and 3,300 permitted activities. For general assessment purposes in that decision, we assumed there could be around 2,800 permitted activities and around 2,000 activities that will require consents.

M3 Similarities and differences between permitted and consented activities

[241] Having spent two and a half years working through plan provisions with the parties, we are satisfied that the standards and other plan provisions would remain substantially the same whether farming activities with a low risk of diffuse discharges were permitted or required consents. Changes, if any, would be minor.

[242] There would be no difference between the time by which FEPs and consent applications would need to be lodged. Both would need to comply with the schedule in Table 3.11-2 of PC1. Consequently, there would be no material difference in the time by which mitigations would start to be implemented or by which reductions in the s 70(3) effects would start to occur in receiving environments.

[243] The two main areas of difference would be the degree of direct oversight by WRC and the implications of applying for and processing an additional 2,800 resource consent. We address each in turn below.

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92 at [219].

The degree of direct oversight by WRC

[244] FEPs will be the primary document used to authorise activities whether they are permitted or consented as it will not be possible to assess the effects of discharges on the environment from individual farms. FEPs for permitted activities must ensure compliance with a range of environmental performance standards, including a requirement to demonstrate that either the risk of diffuse discharges to water is already as low as practicable given the current land use or will be reduced to be as low as practicable within 10 years of PC1 becoming operative. What is practicable is farm specific and will need to be agreed between the farm operator and a CFEP.

[245] WRC will publish and keep up to date operating procedures on the appointment process for CFEPs. CFEPs must:

(a) Demonstrate an understanding of, or have successfully completed training in, the competencies for Certified Farm Environment Planners and Auditors; and

(b) Have a qualification in natural resource management or farm system management; or

(c) Have at least 3 years' experience in a field related to the competencies for Certified Farm Environment Planners.

[246] CFEPs must be approved by the Chief Executive of WRC.

[247] The difference in WRC oversight between permitted and consented activities is that only WRC appointed CFEPs certify FEPs for permitted activities and while they also certify FEPs for consented activities, WRC consent officers also have to be satisfied that the FEPs satisfy the relevant PC1 provisions. We anticipate that some consent officers may not be directly employed by WRC but be external consultants.

[248] We consider it will be critical for the success of PC1 that WRC establishes and publishes appropriate guidelines in a timely fashion for use by farm operators, their advisors, CFEPs and consent officers when preparing, certifying or approving FEPs to ensure expectations are clear and to minimise the potential for different

interpretations of what is required. On the assumption that that is WRC's intention, we consider there would need to be compelling reasons before farming activities with a low risk of diffuse discharges should be required to do more than have their FEPs certified by suitably qualified and experienced independent CFEPs approved by the Chief Executive.

[249] We stated in the interim decision from [204] that:

> …if a permitted pathway was not to be available, potentially an additional 2,800 individual farming activities (give or take) would require consents, which would add cost, result in delays and introduce a significant administration burden with limited, if any, environmental benefit.

[250] In addition, the Court stated previously in relation to the Bay of Plenty Regional Council Rotorua Lakes Plan Change 10:[93]

> [116] We are also particularly concerned to ensure that, as far as reasonably practicable, resources should be used for environmental improvements on-farm, not for unnecessarily high regulatory and monitoring costs.

[251] We are satisfied that compelling reasons do not exist in this case that would justify the need for an additional 2,800 farming activities to apply for resource consents.

The implications of applying for and processing an additional 2,800 resource consents

[252] The consents would need to be applied for and processed over a five-year period, starting one year after PC1 becomes operative. On a pro-rata basis, indicatively, WRC would need to increase the number of its consent processing staff by 140%. An additional 2,800 farmers would need to apply for resource consents and would likely require professional assistance to do so. Whether that came from industry organisations or independent consultants, there would be a cost. The resources required would be additional to the CFEPs who will be required to certify and audit FEPs whether activities are permitted or consented. Appropriately qualified and experienced resource availability could be a significant issue.

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93 *Federated Farmers of New Zealand v Bay of Plenty Regional Council* [2019] NZEnvC 136.

[253] Mr Sinclair stated[94] the Council's policy on cost recovery for consent applications is that it will recover the "actual and reasonable" costs. He indicated that WRC processing costs for a straight-forward controlled activity, which we anticipate would apply, would be $1,500 excluding GST, assuming that the required elements of the application are provided and that no site visit is required. For the purposes or our evaluation, we used an indicative all-inclusive WRC cost of $2,000 per application. For applicant costs, we adopted a figure of $1,000 per application in addition to the cost of FEP preparation. The combined cost to the Region would likely be at least $10 million and possibly more. In our view, any benefits, if they existed at all, would be insufficient to justify that cost.

[254] If all farming activities discharging the primary contaminants were required to obtain consents, the requirements of Schedules D1 and D2 would need to be incorporated in a single document. This would delay the provisions becoming operative for at least three months and more likely longer.

M4 The only alternative to permitted activity status

[255] The only alternative would be to require the activities to apply for resource consents. It has been established that conspicuous change in the colour or visual clarity has already occurred and fresh water has been rendered unsuitable for consumption by farm animals over much of the PC1 area. As a result, WRC would have to decline all such applications and any other applications for consents to discharge the primary contaminants in the Region under s 107(d) and (f).

[256] The implications of all farms in the PC1 area being unable to operate lawfully in accordance with the RMA because they could not operate as permitted activities or obtain resource consents would be extremely serious. While this possibility was not discussed at the PC1 Hearing, it was significant issue at a recent hearing before a different division of the Court in relation to Manawatū-Whanganui Regional Council Plan Change 2.

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94 Mr Sinclair EIC, at [29].

[257] In that case, the Council estimated that of the approximately 440 intensive farming land uses in the region, 235 had been unable to obtain resource consents for nine years by the time of the Court's interim decision dated 9 December 2025. The evidence of the Vice President of the Manawatū-Rangitikei Federated Farmers was:[95]

> … the direct impacts on dairy farmers in the priority catchments of being unconsented are increased costs of borrowing and restrictions on the ability to sell their farms. He outlined that all banks have a policy about environmental sustainability that impacts on lending rates and margins and that if one is operating without consents or your consent is coming up for renewal, the banks will apply a higher risk margin and higher overdraft rate.

[258] If that situation were to apply to 5,000 farms in the Waikato Region, in our view, the effects would be of national significance.

M5 Our findings in relation to ss 32AA and 70(2)

[259] We find that permitted activity status for farms with a low risk of diffuse discharges is the most efficient and effective of the two options and satisfies the requirements of s 70(3). It will ensure a start is made towards restoration of the Waikato River without further delay. We are satisfied that the provisions are the most appropriate way to meet the objectives of PC1 without the need for any amendments or a s 293 process. We are satisfied that the risk of acting to include permitted activity is substantially lower than the risk of not doing so.

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95 *Te Rūnanga o Raukawa v Manawatū-Whanganui Regional Council* [2025] NZEnv C 398, at [255].

Part N Our overall evaluation, findings and directions

[260] The reservations expressed by Mander J quoted at [19] about the statutory test imposed by s 70 and reproduced in Part A4 resonated strongly with this Court. The reference to the difficulties of reasonably assessing region-wide permitted activity rules in accordance with s 70 with any degree of confidence will be clear through this decision. Specifically, the reasons include the variable states of freshwater bodies across the whole region at the time, the range and variability of factors that apply to each, and the acknowledged uncertainties attaching to the available science.

[261] This Court now has an in-depth knowledge of the PC1 environment and the multiple factors that contribute to its current state based on four years of continuous and detailed involvement in the appeals process. Members of the Court have in-depth knowledge of other cases involving some of the same issues. We were able to draw on and cite references from other Court decisions considered relevant to this evaluation.

[262] The final provisions of PC1 are the most appropriate to meet its objectives. They were developed over a 10-year period with extensive community input. We are satisfied that they provide a soundly based and essential first step if Te Ture Whaimana is to be achieved in the longer term. We are satisfied that attempting to modify them further would not result in improved environmental outcomes and would more likely compromise them by delaying a start being made to giving effect to Te Ture Whaimana.

[263] Our findings are as follows:

(a) Section 70(3) effects are already occurring over large parts of the PC1 area.

(b) There is no practical basis on which to determine a specific quantum of reduction in effects that will result from the PC1 provisions, but

we are satisfied that they will reduce the effects as a collective whole to the minimum extent practicable within the 10-year term of PC1.

(c) We are satisfied that it is appropriate that mitigations necessary to satisfy the provisions of PC1 and already implemented by farmers who have taken a proactive approach to reducing their effects should be recognised. The alternative of not recognising proactivity would be a disincentive that could and likely would affect future progress negatively.

(d) We are satisfied that the available science and the limitations of monitoring and predictive modelling options mean it is unlikely that any changes in s 70 effects will be detectable with any certainty within 10 years and more likely in excess of 20 years could be required.

(e) We are satisfied that there is limited potential for intensification of farming activities or expansion of CVP activities that will increase contaminants discharges and that any that is authorised will not compromise compliance with s 70(3).

(f) We are satisfied that some effects of the nitrogen load to come may continue to be observed to a decreasing extent for a few years after PC1 becomes operative in some parts of the PC1 area but may not start to appear in relation to the Upper Waikato FMU until beyond the term of PC1. These are not discharges that can be controlled by provisions in PC1, but may make confirmation of reductions achieved by the provisions more difficult.

(g) We are satisfied that the inclusion of permitted activity Rule 3.11.4.3 is the most efficient and effective way to achieve the objectives in accordance with s 32 of the RMA. We are satisfied that Permitted Activity Rules can be included in PC1 in accordance with current amended s 70 of the Resource Management Act.

(h) The only obvious alternative to the approach taken in PC1 would be to require all farmers discharging the primary contaminants to apply for resources consents. The Council would then have to refuse to grant the applications in accordance with s107. The adverse social and economic effects would be of serious concern.

(i) The Court has no jurisdiction to address s 107 matters in these proceedings.

[264] We considered carefully the three decisions cited at [10] to [14] in Part A4 of this decision, starting with the Supreme Court's definition of "satisfy":

> (to do enough), and a standard meaning relevant in this context – to furnish with sufficient proof or information; to assure or set free from doubt or uncertainty; and to convince; or to solve a doubt, difficulty.

[265] We also considered the observations of the Court of Appeal in *Southland Regional Council v Southland Fish and Game Council* that:[96]

> [23] … Section 70 mandates an outcome and that outcome must be assured by the proposed rule before it is included in the regional plan. Plainly, whether that outcome is achieved by the rule, whatever its precise terms, is an evaluative matter upon which SRC must be satisfied, before the rule's inclusion. … Nothing in this judgment should be taken to presume that a particular form or type of evaluation is needed.

[266] And the observations of that Court in *Whakatane District Council v Bay of Plenty Regional Council*:[97]

> [74] … It will be for the public decision maker to demonstrate that proper consideration was given to the statutory requirement and that it carried out its statutory obligation on the basis of a sufficient foundation of information to satisfy itself of that threshold. …

[267] We also noted the following reservations expressed by Mander J in *The Environmental Law Initiative v Canterbury Regional Council*:[98]

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96 [2024] NZCA 499.
97 [2010] NZCA 346:
98 [2025] NZHC 4156.

> [110] I have considerable reservations whether, in any practical sense, the statutory test imposed by s 70 could realistically be applied to a proposed "region-wide" permitted activity rule for diffuse discharges, or reasonably be assessed with any degree of confidence given the variable states of freshwater bodies across the whole region at the time, the range of factors that applied to each, and the acknowledged uncertainties attaching to the available science. …

[268] We set out the context within which our determination must be made in Part B2, which includes a lack of key data to form the basis of any evaluation and the lack of methods to assess the effects of discharges on aquatic life from individual farms. Elsewhere through the decision we describe the scale, complexities and uncertainties associated with almost all material aspects of the case. In combination, this means that it is not possible to predict or verify what, if any, region-wide changes in effects on aquatic life will have occurred in 10 years and it is more likely that 20 years or more will be required before reliable conclusions will be able to be drawn. The same applies to conspicuous changes in colour and visual clarity and the rendering of fresh water unsuitable for consumption by farm animals. For these reasons, we share the reservations expressed by Mander J.

[269] While acknowledging these constraints, the question we have to answer is whether we are satisfied that the permitted activity standards in PC1 in combination with any other provisions in the plan, will contribute to a reduction in s 70(3) effects within 10 years. As set out in the decision, we took a bottom up, step-by-step and holistic evaluation of the evidence in considerable detail that reflects the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal in accordance with s 32, all of which are of considerable significance.

[270] Predicting the future 10 years ahead can only be based on the best currently available information and an expectation that the plan provisions will be implemented efficiently and effectively . We are satisfied that the information furnished as the basis for our decision is the best currently available after our thorough review and further consideration of the evidence. We must expect that WRC will implement the provisions in accordance with its functions, powers and duties under ss 30 and 84. We are also satisfied that the provisions are the most

appropriate to meet the objectives of PC1 for the purposes of our ss 32AA and 70 evaluations, and that attempting to amend them further would significantly delay progress towards achieving Te Ture Whaimana and would not be consistent with the purpose of the RMA.

[271] Uncertainties will continue to exist and there is no way that can be changed without implementing PC1 and likely one or more further plan change and even then, there will still be uncertainties. However, based on the evidence, there can be no doubt that implementation of the PC1 provisions efficiently and effectively will reduce diffuse discharges of the primary contaminants within 10 years. Those reductions are already underway as result of mitigations implemented over the last 10 years. It is inconceivable in our view that there would be no reduction in s 70(3) effects within 10 years when there will have been significant reductions in discharges during and prior to that 10-year period. We are satisfied that, while there is no practical way to estimate or predict the extent of the reductions in the s 70(3) effects that will be achieved, a reduction in those effects will occur to the greatest extent practicable within 10 years by the implementation of the PC1 provisions, including permitted activity Rule 3.11.4.3.

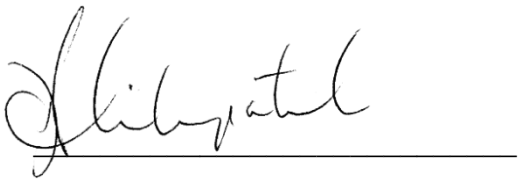
Directions

[272] We direct parties to advise the Court **no later than 5 p.m. on Friday 20 March 2026**:

(a) If they consider further evidence needs to be provided that could potentially mean a different determination would or could result.

(b) Identify any matters of fact, expert opinion or law of direct relevance to our s 70 evaluation that they consider have been omitted or not been interpreted or referenced appropriately.

For the Court:



D A Kirkpatrick

Chief Environment Court Judge | Kaiwhakawā Matua o te Kōti Taiao

Attachment 1

Summary of evidence

Part C Sources of contaminants contributing to s70(3) effects

C1 General background

[1] Dr Scarsbrook stated:[99]

> [19] Land use within the Waikato-Waipā catchment is dominated by pastoral agriculture and the spatial extent of pastoral agriculture increased during the period 2001 to 2018, particularly in the Upper Waikato FMU. In addition, there has been an intensification of agricultural land use over the same period. There is a strong link between the extent and intensity of pastoral agriculture and degraded water quality. Levels of contaminants tend to increase with the extent and intensity of pastoral agriculture.
>
> [20] **…** the current Waikato Regional Plan has limited controls on the effects of pastoral farming on water quality.
>
> …
>
> [114] Levels of N and P tend to increase with an increasing proportion of pastoral land use in the catchment …

C2 The effects of natural variations

[2] Surface water quantity is one of the five contributing factors to ecosystem health in the NPSFM. It varies seasonally and while ecosystems have adapted to natural variations, changing patterns can involve both high intensity events and prolonged droughts that can result in increased stress on ecosystem health. Extreme events can also cause significant damage to farm infrastructure such as stream fences,[100] with a consequent reduction in mitigation effects until repaired.

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99 Dr Scarsbrook EIC, at [19], [29], [114].

100 Mr Pinnell EIC, at [7].

[3] We received no evidence relating to surface water quantity, nor did we find any indication that it was addressed in any detail in evidence before the Council Hearing Panel. Accordingly, we cannot consider it other than to observe that there is broad acceptance in New Zealand generally that there have been greater frequencies and intensities of storms, which appears likely to continue. This is relevant to any future assessment of the causes and effects on the aquatic environment, including increased erosion and sediment loads in receiving environments. There is also the potential for longer droughts in parts of the country, which will increase adverse effects on aquatic life.

C3 Anthropogenic sources of Total Nitrogen and Total Phosphorus

[4] Anthropogenic sources contribute approximately 67% of Total Nitrogen in the PC1 area and natural sources contribute 33%. Diffuse sources of Total Nitrogen contribute some 61% of the total catchment load or 90% of the load from anthropogenic sources and point sources contribute the remaining 10%. Diffuse sources of Total Phosphorus contribute 36% of the total catchment load and point sources contribute around 15%. Natural sources contribute the remaining 50% (approximately) of the catchment load.

C4 Anthropogenic sources of sediment

[5] Suspended sediment loads in the Waikato River, measured at Hamilton (Central Waikato FMU) and Rangiriri (Lower Waikato FMU), have been estimated at 66,000 t/yr and 261,000 t/yr, respectively, with much of the change being contributed by the Waipā River catchment, which supplies around two thirds of the Waikato's suspended sediment load.[101]

[6] Dr Scarsbrook stated:[102]

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101 Dr Scarsbrook EIC, at [80].

102 Dr Scarsbrook EIC, at [134], citing Andrew Hughes *Waikato River suspended sediment: loads, sources & sinks* (Waikato Regional Council, Technical Report 2018/65, May 2015).

> [36] Hughes also indicated that riverbanks could be a significant sediment source and concluded around ~60% of the catchment sediment was sourced from riverbanks. However, bank erosion on the mainstem of the Waikato River appears to be low, with estimates of around 5% of actively eroding banks.

[7] From our review of the source paper, riverbank erosion has been identified as an important process in New Zealand although there has been very little quantitative research carried out to date. It also stated that it has anecdotally been identified as an important source of sediment within the Waikato River catchment.

[8] Dr Depree stated that:[103]

> [1.8] … drystock farmland contributes approximately 3-times more sediment than dairy (66% compared to 21%) based on long-term soil erosion data. In the high sediment yielding catchments, drystock farmland contributes 69% and 80% of sediment (based in long-term soil erosion data).
>
> …
>
> [1.10] Soil erosion is highly variable across the PC1 catchment ranging from <50 t/km²/yr to >5,000 t/km²/yr. The majority of soil erosion is concentrated in a few subcatchments within the Waipa and Lower Waikato FMUs.
>
> [1.11] Within these subcatchments, land with very high soil erosion (between 2,000 and 20,000 t/km²/yr) account for just 1.6% (13,430 ha) of the area of PC1, but contributed 37% of the estimated total soil erosion. Approximately 90% of this high erosion land is on drystock farmland.

[9] As farming activities occupy around 70% of the PC1 land area,[104] they can be expected to be the largest contributor of sediment to the aquatic environment.

C5 Sources of *E. coli*

[10] We received limited evidence on sources of *E. coli*. However, in the Interim Decision at [115], we referred to a significant deterioration in *E. coli* concentrations along the mainstem of the Waikato River over the period 1991 to 2020, noting that

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103 Dr Depree EIC, at [1.8] to [1.11].
104 Interim Decision, at Table 2.

NIWA was unable to identify clear reasons for the change.[105] In its response to WRC about possible causes of the deterioration, NIWA identified sources of *E. coli* as follows:[106]

> The increases in E. coli concentrations were not significantly correlated with changes in livestock density or land use, and were of similar relative magnitude in predominantly pastoral, forested, or urban catchments. The increase in faecal contamination occurred in streams across all major land uses in the Waikato region, including native and plantation forest, making it unlikely that the general trend is related to management actions on livestock farms. Ongoing improvements in stock exclusion on pastoral farms continued in the 2015-2019 period. Although the input of faecal contaminants to streams was expected to decrease through these efforts, increased concentrations were observed across the region. The increases in E. coli concentration were unlikely to be related to changes in point source discharges (wastewater treatment plants or dairy sheds); previous investigations indicated that point sources make a small contribution to the contaminant load measured at most stream monitoring sites. The load discharged from these point sources is also expected to decrease over time rather than increase because of improvements in wastewater treatment.
>
> Increases in the extent of stream shading arising from riparian protection programmes have been small over the recent period, so reductions of solar radiation (and light-induced disinfection) were likely to be small or negligible, and unlikely to explain the increase in E. coli concentrations observed.
>
> Turbidity and visual clarity – often considered as proxies for E. coli because of co-mobilization of fine particles and faecal matter – did not show similar direction of trend in water quality to E. coli, …
>
> …
>
> Land use affects the source of faecal material. Urban land uses contribute faecal pollution from domestic and feral animals (defecating on streets and roofs) as well as human sources (e.g., sewer leaks, wastewater plant discharges). Pastoral land uses contribute faecal pollution mainly from livestock, including dairy parlour washings via treatment ponds or land irrigation. Feral animals, and birds are important in all land uses, and septic tanks with onsite disposal systems may be significant in rural land. Plantation and conservation forests typically contribute far less faecal pollution (principally from feral mammals and birds).
>
> …
>
> Statistical and mass balance modelling in the Waikato Region has identified that pastoral areas are associated with higher microbial loads and concentrations in streams, although Hamilton City was also associated with high loading (Semadeni-Davies et al. 2015, 2016). …

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105 *E. coli trends in Waikato streams*, Exploration of drivers and alternative trend analysis, Prepared for Waikato Regional Council by S Woodward, S Elliot, R Davis-Colley & R Stott (NIWA), Report IS 2022/09, June 2022.

106 at pages 9, 15 and 17.

[11] A 2015 ESR study of *E. coli* sources in five sub-catchments using faecal source tracking showed:[107]

> [140] Ruminant and avian pollution was detected in almost all samples. Ruminant pollution was generally more dominant following rainfall. No human pollution was detected at any of the sites. Markers appeared to reflect more aged than fresh sources of contamination, indicating transport from upstream rather than local sources.

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107 Dr Scarsbrook, EIC at [140], citing Elaine Moriarty *Sources of Faecal pollution in Selected Waikato Rivers* (Institute of Environmental Science and Research Limited (ESR), Draft Technical Report HR/TLG/2015-2016/7.3, 23 November 2015).

Part D The existing state of water quality in the PC1 area

D1 Water quality evidence

[1] We addressed water quality in the PC1 area in Parts C11 to C13 of the Interim Decision. Dr Scarsbrook and the Council Hearing Panel characterised the overall surface water quality of the Waikato-Waipā River catchment as generally degraded, with the degree and type of degradation varying throughout the catchment.[108]

[2] In relation to rivers and streams, key findings were:[109]

> [40](a) The Upper Waikato River has high water quality (attribute bands A or B) reflecting the high quality of its source, Lake Taupō.
>
> [40](b) As one moves downstream, observed water quality in the river declines, primarily reflecting the influence of tributary and groundwater inputs of poor water quality but also contributed to by direct point source inputs.
>
> 40(c) By the time the river reaches the Lower Waikato FMU, water quality attributes are in C or D bands (D being below the national bottom-line) and it does not meet the *E. coli* swimmable criteria of the NPS-FM 2014.
>
> [40](d) Much of the Waipā River (which joins the Lower Waikato River at Ngāruawāhia) has, and many of its tributaries have, low water clarity and high *E. coli* levels that fail to meet swimmable criteria.
>
> …
>
> [86] Bill Vant assessed trends in water quality over the period 1991-2020. This is the most recent analysis of trends for the Waikato-Waipā catchment.
>
> [87] Along the mainstem of the Waikato River, Vant identified what he considered important improvements in concentrations of ammonia, chlorophyll *a* and TP. Conversely, important deteriorations occurred in *E. coli* concentrations and in records of TN. Intensification of pastoral farming in the Waikato catchment was considered the most probable cause of this deterioration in TN concentrations in the river.

[3] Lakes generally have poor water quality, with most peat and riverine lakes having D band attribute states for total nitrogen, total phosphorus and chlorophyll *a*

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108 Dr Scarsbrook EIC, at [18] and Recommendation Report, at [175].
109 Dr Scarsbrook EIC, at [39], [40] and [83] to [87].

(i.e., below the NPSFM National Bottom Line). At the time, there was a paucity of data for some lakes, such as Dune and 'Volcanic' lakes, and some attributes (e.g. *E. coli*). Dr Scarsbrook stated that there are around 50 shallow lakes in the Lower Waikato FMU and that many have lost their submerged vegetation communities and are now dominated by phytoplankton.[110] Waikato shallow lakes are under pressure from a combination of factors, including nutrient loads, impacts of pest fish, lake level fluctuation and climate change.[111]

[4] Long term trend analysis at 12 long term monitoring sites indicated a general increase in total nitrogen and total suspended solids (**TSS**) concentrations, and a general decrease in total phosphorus. However, over shorter timescales (three to five years) notable improvements in TLI[112] scores have occurred in six out of 12 long-term monitored SOE lake sites.

[5] The extent of representative bog habitat dominated by sedges and wirerush within the Whangamarino Wetland has declined significantly since 1963, which Dr Robertson stated is associated with changes in catchment land use and altered hydrology. The ecological condition of the swamp, fen and marsh wetland types has also declined over the past 50 years, associated with high volumes of sediment, nitrogen and phosphorus entering the wetland system, coupled with an altered hydrological regime.[113]

[6] Dr Robertson described a then recent water quality event as follows:[114]

> [77] The urgency of addressing water quality contamination at Whangamarino Wetland was apparent during 2022 and 2023. During the summer, and autumn of 2022-2023, a 'blackwater' event occurred (resulting from very low dissolved oxygen levels) and then subsequently a botulism outbreak. Dissolved oxygen levels on the Whangamarino River in the wetland were recorded as below 1.0 mg/l (sometimes near 0.1 mg/l) during December 2022, February 2023 and March 2023 [DOC Ranger monitoring data].

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110 Dr Scarsbrook EIC, at [89].
111 Dr Scarsbrook EIC, at [40](e) and [93].
112 Trophic Level Index, a measure of the ecological health of lakes.
113 Interim Decision, at [272] based on the evidence of Dr Robertson.
114 Dr Robertson EIC, at [77] – [78].

> [78] The water quality event had a significant impact on the ecosystem health of Whangamarino Wetland. There were more than 1600 bird deaths reported (Fish and Game database from bird recovery field work), including many indigenous species and fish kills, including longfin eel/tuna (DOC Rangers pers. comm).

D2 WRC's State of the Environment Report 2022

[7] We were referred to this Report by Dr Scarsbrook.[115] We referred to the river and stream monitoring section of the report which included the following information on the percentage of catchments in the PC1 area with low, moderate or high nitrogen loading.

Nitrogen Loading (% of total catchment)			
Catchments	Low	Moderate	High
Upland Waikato	37	58.5	4.4
Waipā River	20.8	59.2	19.9
Lowland Waikato	30.2	48	21.8

[8] The Report explained further in relation to nitrogen that:[116]

> Diffuse nitrogen, highlighted as a problem in previous water quality reports, has continued to worsen in many waterbodies.
>
> In horticultural areas (such as Pukekawa and Pukekohe), increases in nitrogen were detected in monitoring wells and streams. All monitored tributaries of the Waikato River from Taupō to Karāpiro also recorded worsening nitrogen trends for the period 1990 to 2020. This area also experienced the greatest pastoral intensification, with land cover changing from pine forest to dairy pasture. Urine patches and fertiliser applications are not entirely captured by pasture grass and the excess nitrogen travels to streams via groundwater; and narrow strips of riparian vegetation fenced from livestock cannot take up all the surplus nitrogen.
>
> Conversely, nitrogen concentrations have decreased in some areas where dairy farming is long established. For example, most monitoring wells and streams in the Hamilton basin have recorded decreasing nitrogen concentrations.
> In deep aquifers that lack oxygen, denitrification can eliminate nitrate from groundwater. Thus, increasing nitrogen in streams would be driven by shallow groundwater pathways where there is little denitrification. Understanding the groundwater pathways that determine nitrogen concentrations in streams improves

115 Dr Scarsbrook EIC at [74] referring to WRC's 2022 SOE Report.
116 WRC's 2022 SOE Report, at page 46.

our understanding of where land use controls will be more effective in achieving nitrogen targets for receiving waters.

[9] Other relevant information in the Report includes:[117]

> … there are several lines of evidence supporting a real reduction in phosphorus, including reduced algae growth, a reduction in phosphorus levels reported from other regions (McDowell at el. 2019), and reductions in phosphorus inputs from wastewater.
>
> The move to land disposal of washdown water from dairy sheds is expected to reduce phosphorus discharges, as soils can capture the solids to which phosphorus is bound and put it back into growing pasture.
>
> Alongside declining phosphorus, the concentration of ammonia declined at half of the monitoring sites. Ammonia is an indicator of large inputs of anoxic water, such as organic waste, which is rapidly converted to nitrate in well oxygenated rivers.
>
> …
>
> We did not detect widespread declines in sediment in rivers (measured as turbidity, suspended sediment and black disc water clarity).
>
> …
>
> Bacteria is transported with fine sediment, and both sediment and bacteria remain at high levels in many rivers. Using water clarity as a measure of sediment, 50 per cent of river sites were below the National Policy Statement for Freshwater Management 2020 (NPS-FM) national bottom line for black disc. Also, 68 per cent of sites were the worst band for Escherichia coli.
>
> …
>
> … nitrogen concentrations continued to increase in many rivers. Nitrogen, like phosphorus, is a major plant nutrient. Increases in nitrogen were detected at nine of the 10 monitoring sites on the Waikato River mainstem (all except Taupō gates). The biggest increases were in the upper Waikato, where all tributaries between Taupō and Karāpiro recorded worsening trends for the period 1990 to 2020. Cropping areas, including Pukekawa and Pukekohe, exhibited increasing nitrate at nine of 11 monitoring wells, and streams in this area also reported increasing nitrogen.
>
> …
>
> Many of our riverine and peat lakes have 'flipped' from aquatic plant dominated to algae blooms, which is a symptom of eutrophication. The displacement of native plants and fish, replaced by algae and invasive fish, represents a loss of biodiversity and ecosystem health. Reports of fish kills are now frequent on lakes Ngāroto and Hakanoa.

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117 WRC's 2022 SOE Report, at pages 40-42.

…

> Most monitored lakes fail to achieve the national bottom lines for compulsory attributes in the NPS-FM. However, there have been recent signs of improvement for several lakes. The Trophic Level Index (which combines several NPS-FM attributes) has improved over the last three years for six of the 12 lakes with long term monitoring data. Lakes Waahi and Serpentine North recorded their best Trophic Level Index to date in 2022. Lake Serpentine North is a peat lake with moderate nutrient levels (classed mesotrophic), diverse zooplankton and 'excellent' aquatic plant communities.
>
> But the water quality of Lake Waikare has continued to decline. It is one of only two lakes (of the 12 with long term data) to show an increase in phosphorus in the last five years. Lake Waikare stands out as our most polluted lake. It is now rated as hypertrophic, placing it at the opposite end of the spectrum to oligotrophic lakes like Taupō.

[10] The Report identified the need for better control of faecal bacteria from critical source areas through farm plans, stating:[118]

> The lack of improvement in faecal bacteria levels to date indicates that more work is needed to control potential sources. To date, action on farms has focused on stock exclusion from waterways and improved farm dairy effluent management. These should continue to be primary mitigation actions in farm plans, but we recommend extending actions to include better management of other critical source areas, such as tracks, raceways and intensive grazing of crops.
>
> Faecal bacteria levels breach national bottom lines (NPS-FM 2020) for many streams, especially in the Waikato, Waipā and Hauraki freshwater management units where a substantial reduction in faecal bacteria is required. Extensive riparian fencing and planting has not translated to a reduction in E. coli concentrations in monitored streams to date. Much of the faecal discharge may be bypassing fenced buffers, negating the reduced inputs achieved from stock exclusion.
>
> …
>
> There is a moderate level of confidence that better control of critical source areas will better control bacteria discharges, but may well be insufficient to achieve target attribute bands for E. coli.

[11] The Report included a similar commentary about sediment discharges:[119]

> Sediment levels in streams have not increased significantly, but we are yet to see the significant gains expected from efforts to fence and plant erodible soils and stream

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118 WRC's 2022 SOE Report, at page 52.

119 WRC's 2022 SOE Report, at page 54.

> banks. This may be influenced by the mass of sediment already stored in streambanks and within river systems, representing a 'lag effect' between substantial catchment works to reduce erosion and the measurement of suspended sediment in rivers.
>
> There is some evidence that sediment levels have improved more than bacteria, but the same recommendations apply for both contaminants. The main point of difference is that critical source areas for sediment might not receive faecal waste.
>
> Forestry operations also contribute to sediment loads. Council monitoring will not reveal the consequences of easing sediment controls through the National Environmental Standards for Plantation Forestry (2017) until after most forests have been harvested. Predictions for more intense rainfall events will increase the importance of protecting erodible landscapes.

[12] In relation to the water quantity aspect of ecosystem health, the Report recorded:[120]

> We have observed long-term trends of reducing rainfall and increasing demand. Climate change is predicted to increase drought frequency and evapotranspiration, further reducing water availability and increasing demand.
>
> …
>
> Recent research demonstrates nitrogen loads from shallow groundwater pathways respond within a few years to land management. Exceptions include pumice areas, like the Taupō catchment, where much of the nitrogen load can take decades to reach the stream.

D3 Changes in contaminant concentrations through the catchment

[13] The following graphical illustrations of increases in Total Nitrogen, Total Phosphorus, *E. coli* and turbidity from headwaters to river outlets from 2017 to 2021 are reproduced from the supplementary evidence of Dr Scarsbrook.

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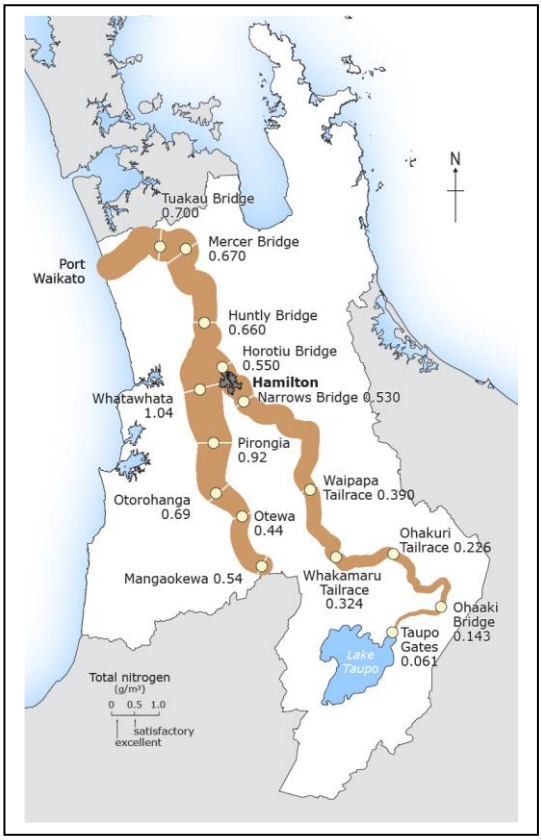
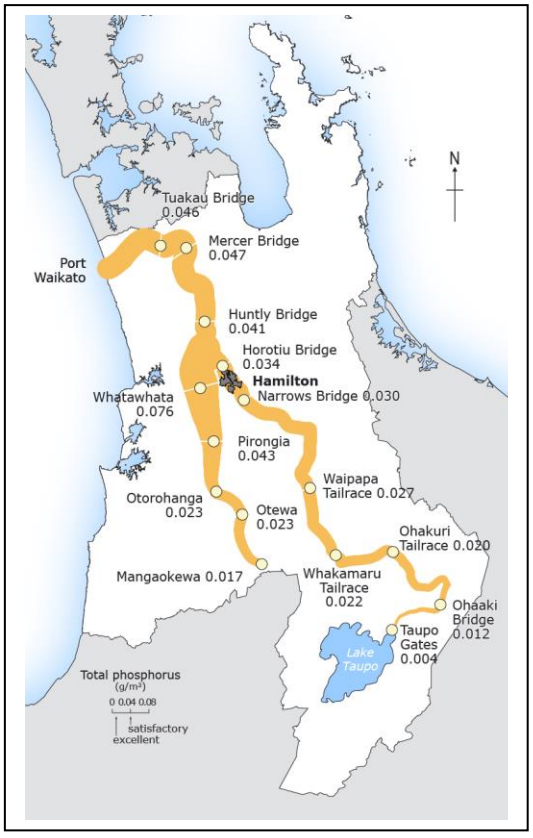
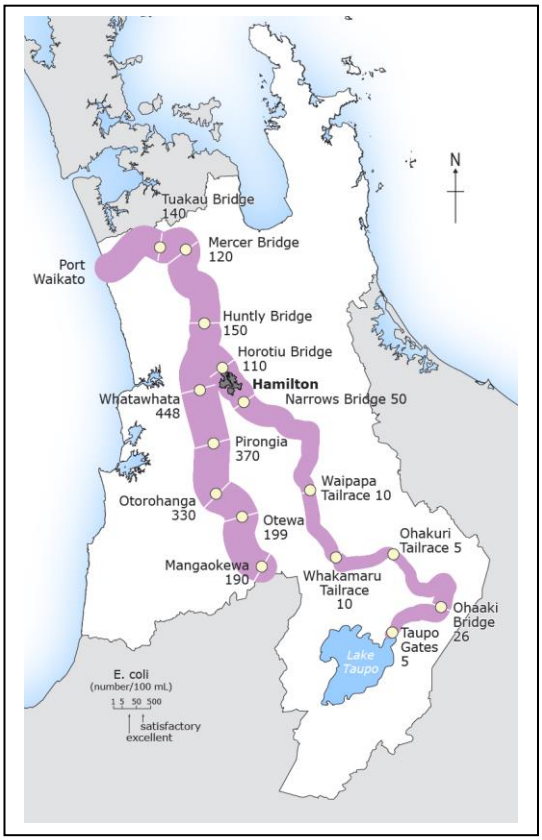
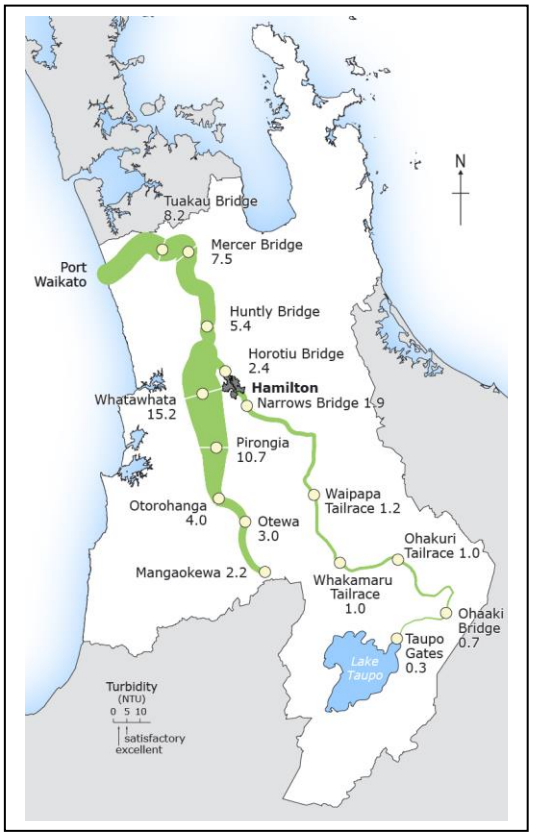
120 WRC's 2022 SOE Report, at pages 52 and 53.


N
Tuakau Bridge
0.700
Mercer Bridge
0.670
Port
Waikato
Huntly Bridge
0.660
Horotiu Bridge
0.550
Hamilton
Narrows Bridge 0.530
Whatawhata
1.04
Pirongia
0.92
Waipapa
Tailrace 0.390
Otorohanga
0.69
Otewa
0.44
Ohakuri
Tailrace 0.226
Mangaokewa 0.54
Whakamaru
Tailrace
0.324
Ohaaki
Bridge
0.143
Taupo
Gates
0.061
Lake
Taupo
Total nitrogen
(g/m³)
0 0.5 1.0
satisfactory
excellent


N
Tuakau Bridge
0.046
Mercer Bridge
0.047
Port
Waikato
Huntly Bridge
0.041
Horotiu Bridge
0.034
Hamilton
Narrows Bridge 0.030
Whatawhata
0.076
Pirongia
0.043
Waipapa
Tailrace 0.027
Otorohanga
0.023
Otewa
0.023
Ohakuri
Tailrace 0.020
Mangaokewa 0.017
Whakamaru
Tailrace
0.022
Ohaaki
Bridge
0.012
Taupo
Gates
0.004
Lake
Taupo
Total phosphorus
(g/m³)
0 0.04 0.08
satisfactory
excellent


N
Tuakau Bridge
140
Mercer Bridge
120
Port
Waikato
Huntly Bridge
150
Horotiu Bridge
110
Hamilton
Narrows Bridge 50
Whatawhata
448
Pirongia
370
Waipapa
Tailrace 10
Otorohanga
330
Otewa
199
Ohakuri
Tailrace 5
Mangaokewa
190
Whakamaru
Tailrace
10
Ohaaki
Bridge
26
Taupo
Gates
5
Lake
Taupo
E. coli
(number/100 mL)
1 5 50 500
satisfactory
excellent


N
Tuakau Bridge
8.2
Mercer Bridge
7.5
Port
Waikato
Huntly Bridge
5.4
Horotiu Bridge
2.4
Hamilton
Narrows Bridge 1.9
Whatawhata
15.2
Pirongia
10.7
Waipapa
Tailrace 1.2
Otorohanga
4.0
Otewa
3.0
Ohakuri
Tailrace 1.0
Mangaokewa 2.2
Whakamaru
Tailrace
1.0
Ohaaki
Bridge
0.7
Taupo
Gates
0.3
Lake
Taupo
Turbidity
(NTU)
0 5 10
satisfactory
excellent

Part E Effects on aquatic life

E1 Aquatic life in the Waikato region, matters to be considered and effects occurring

[1] While the adverse effects on aquatic life in the Whangamarino and lake catchments and the extent of water quality degradation in rivers and streams were clear from the evidence, the direct evidence on the effects on aquatic life in rivers and streams was more generic in nature.

[2] Ms McArthur stated that while PC1 responds to many of the key water quality issues in the Waikato and Waipā catchments, direct consideration of the impacts of water quality on aquatic life, habitat and ecological processes are largely absent. With specific regard to ecosystem health, her evidence included:

> [17] Considerations of aquatic biodiversity, indigenous flora and fauna and their habitats, the conservation threat status of those significant species and tangata whenua values including mahinga kai and taonga species are also important. … The PC1 catchments contain significant biodiversity hotspots, which are largely unprotected from land use and development. The catchment also holds a diverse assemblage of indigenous fish and invertebrate species, many of which are declining nationally and at risk of or threatened with extinction. Some communities of aquatic fauna, such as the landlocked breeding populations of usually migratory fishes in the lower Waikato lakes are unique to these catchments.
> …
>
> [18] Also needed is a greater consideration of the interrelated nature of waterbodies in the catchments and the cumulative effects of up-catchment water quality contributions and land use on sensitive receiving environments…
> …
>
> [53] Nuisance benthic periphyton may proliferate in the hard-bottomed rivers of the Waikato and Waipā catchments if dissolved nutrients are not managed, resulting in adverse effects on ecosystem health via direct physical changes to instream habitat and macroinvertebrate community health, or changes to ecological stressors, for example, diurnal fluctuations in dissolved oxygen and pH. In soft-bottomed streams, elevated nutrients may also contribute to the proliferation of nuisance macrophytes, with similar adverse outcomes for habitat, flow, dissolved oxygen, and other ecosystem stressors (Matheson et al. 2012 and 2016).
> …

[3] Ms McArthur referred to clause 3.13 of the NPSFM, which addresses special provisions for attributes affected by nutrients. It provides examples of attributes

affected by nutrients, which include periphyton, dissolved oxygen, submerged plants, fish, macroinvertebrates, and ecosystem metabolism. When addressing indigenous fish and threatened species she stated:

> [40] The leading causes of decline in indigenous fish in Aotearoa New Zealand have been identified as degrading water quality, nutrient enrichment, water abstraction, invasive and exotic fish species, loss of habitat via land use, downstream barriers to migration, loss of riparian vegetation and river modification.
> …
>
> [42] Given the state of indigenous fish nationally and poor fish diversity and threat status compared to global trends, remaining habitats with high diversity (species richness), such as the Waikato catchment, and intact indigenous fish communities are of significant biodiversity value in New Zealand.

[4] Dr Scarsbrook stated:[121]

> [66] The Waikato River provides a habitat for a variety of freshwater flora and fauna, with at least 21 species of native fish and crustaceans and 13 species of introduced fish, including both valued sport fishery species (e.g. trout) and pest species (e.g. koi carp). Natural and man-made barriers along the upper river have restricted access for native migratory fish species.
>
> …
>
> [69] In comparison to the upper Waikato River, the lack of any major mainstem barriers to migratory fish passage, along with a relatively flat gradient, enables both migratory native species and non-migratory invasive species (e.g. koi carp, brown bullhead catfish) to reach significant distances inland.
>
> [104] Increased levels of sediment, nutrients, and microbial pathogens, along with changes in hydrology, physical habitat structure and changes in temperature and light regimes associated with agricultural land use, can have significant adverse effects on a range of values and uses in New Zealand freshwaters.
>
> [105] Increased nutrient delivery, changes in flow and modified light and temperature regimes associated with agricultural land use often lead to increased growth of aquatic plants and algae in water bodies draining those catchments Controls on eutrophication to maintain or improve ecosystem health often involve mitigating nutrient losses from agricultural land and increasing the attenuation of nutrients before they reach sensitive water bodies.
>
> [106] N and P are essential nutrients for the growth of aquatic plants and algae. Excess nutrients can create algal blooms on the bed of rivers and in the water column of lakes and lake-fed (or impounded) rivers. These algal blooms can reduce habitat quality for fish, birds and other aquatic life, reduce recreational values, and have toxic effects when algal blooms include toxin-forming cyanobacteria. …

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121 Dr Scarsbrook EIC, from [66] and from [104]

> [107] Sediment inputs to waterways can impact on multiple components of aquatic ecosystems. Increased suspended sediment reduces water clarity and can reduce the foraging ability of native and introduced fish. Deposited sediment can smother the streambed reducing habitat availability for fish and invertebrates. Suspended sediment also reduces suitability for recreational values.
>
> [108] Management actions targeted at improving instream habitat quality, particularly reducing fine sediment deposition, when applied across the entire stream network are likely to yield the most widespread improvement in biological condition indices.
>
> [115] What is important to note is that there is a limit to how much mitigation can achieve, particularly when balanced against intensification. Even where intensification is tightly controlled, mitigations can only achieve a certain degree of nutrient reductions. Beyond this threshold, changes in land use will be required.

[5] Dr Ausseil had recently part of an expert panel tasked with examining the implementation of the NPSFM relating to attribute states. He stated that key findings included:[122]

> [47](a) Natural variability is the variation in values of an attribute caused by natural processes. For example, river flows and nutrient concentrations exhibit natural variability over space and time due to weather, climate, and physical and ecological processes. Natural variability is independent of human influences or measurement error. Natural variability of an attribute occurs over a range of timescales (e.g., diel cycles, seasonal cycles, and interannual variability associated with naturally occurring trends or climatic cycles).
>
> [47](b) Sampling error is statistically defined … [and] is only an estimate of the "true" attribute state because it is calculated from a limited number of measurements over a finite assessment period.

[6] He then provided an example showing "some measure of sampling error, and the rolling 5-year median show how this attribute has shifted from Band A to B or C state over time, most likely as a result of climatic patterns" and commenting "essentially this demonstrates that a "baseline attribute state" is not a fixed value over time, and when we choose to represent it by a single number, uncertainty must be acknowledged".

[7] Further findings from the expert panel included:[123]

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122 Dr Ausseil EIC, at [47].

123 Dr Ausseil EIC, at [49].

> (a) … scientists should acknowledge and communicate uncertainty associated with attribute state.
>
> (b) Given the lack of readily available methods to make statistically robust comparisons of current and target attribute states, we recommend that temporal trend assessments … are used as the primary means to indicate if a [attribute state] is on the right trajectory …

[8] Dr Ausseil explained the need for caution in interpreting results, using the following example:

> [51](b) … a short-term apparent degradation driven by rainfall patterns could be interpreted as a sign that mitigations have not been effective, when in fact water quality is improving overall. Conversely, a short-term climate driven apparent improvement could mask an actual water quality degradation and delay the management response.

[9] He also considered it critical that when assessing whether a specific response in water quality was caused by management actions, those actions must be recorded in detail, because:

> [52] Technical analysis of water quality and catchment data often fails to robustly assign causal links between pressures (e.g. land use) and response (e.g. water quality) simply because of the general lack of data on pressures and how they may have changed over time.

[10] He noted that meeting the phosphorus and nitrogen target attribute states in the lower Waikato River will require reductions of nitrogen and phosphorus loads across the whole catchment. He expressed the need for caution to ensure there is not an impression that "no improvement is required in sub-catchments where a target attribute state has been defined as the same as baseline ("current") state", which would, in his opinion, severely compromise the achievement of nitrogen and phosphorus targets in the Waikato mainstem.

[11] Dr Depree provided the following figure and stated:[124]

> [3.8] *E. coli.* are over-allocated (need to reduce) at 70-80% of sites, visual clarity (suspended sediment) is over allocated at >90% of sites, while median nitrogen toxicity measures are over-allocated at around 20% of sites.

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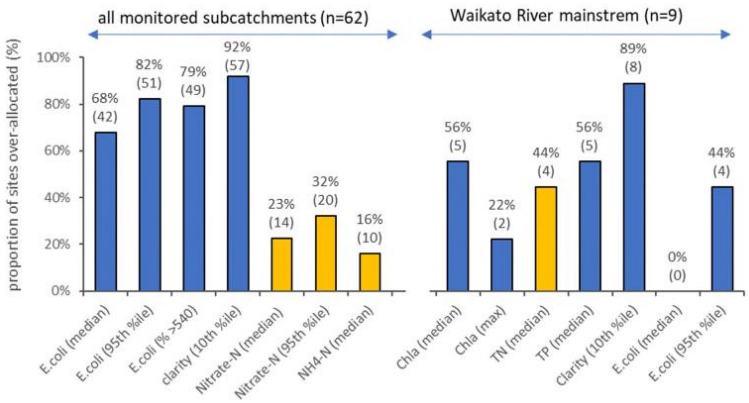
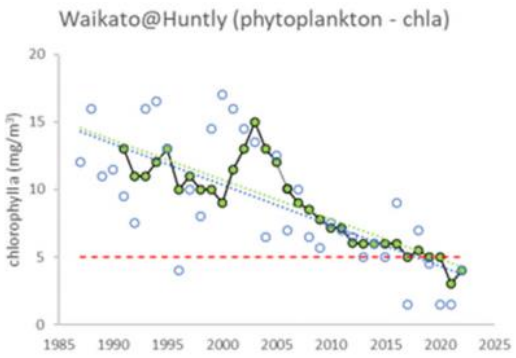
124 Dr Depree EIC, from [3.8].

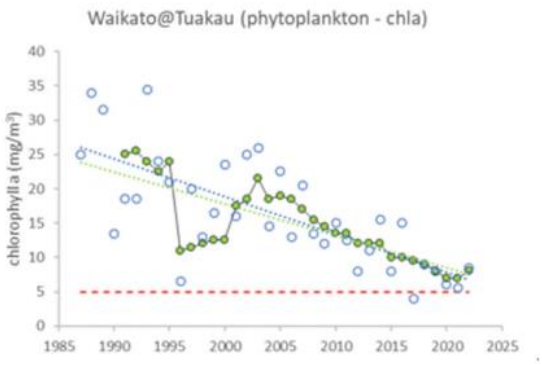


[12] He stated that both the average magnitude of reductions/improvements required and the number of sub-catchments classified as over-allocated are greater for sediment and *E. coli*, compared with nutrient reductions.

[13] We note that he questioned the focus of PC1 on nitrogen, including under the heading "Phosphorus, not nitrogen, is the limiting nutrient for mainstem phytoplankton". The Court is aware that which of nitrogen and phosphorus has the greater influence has been the subject of on-going scientific debate for at least the best part of 50 years. While we do not consider that to be material to our current evaluation, it is a further illustration of the complexities involved in assessing effects on aquatic life and how best to mitigate them.

[14] Dr Depree was encouraged to see that almost two thirds (62%) of the environmentally important trends reported by Vant (2021) for Waikato River sites were improvements. He reproduced the following illustration of improving chlorophyll *a* trends at lower Waikato River site, where concentrations are greatest, and are either at, or approaching, the 80 year phytoplankton target of 5 mg/m^3 shown by the red dashed line.





[15] Dr Scarsbrook stated that *E. coli* does not have direct negative effects on aquatic ecosystems, although the presence of *E. coli* will tend to also be associated with nutrients, other organic contaminants and sediment.[125] On the other hand, Woodward *et al.* found that:[126]

> Turbidity and visual clarity – often considered as proxies for E. coli because of co-mobilization of fine particles and faecal matter – did not show similar direction of trend in water quality to E. coli, according to the GAM analysis after adjustment for season, temperature and rainfall. Turbidity likely improved at 45 of 82 sites (55%) in the 2015-2019 period and visual clarity likely improved at 31 of 75 sites (41%), whereas there was widespread deterioration in microbial water quality over the same period.

E2 WRC's State of the Environment Report 2022

[16] The WRC SOE Report includes the following table relating to ecological health.

Water quality for ecological health 2015 to 2019			
Catchments	Excellent	Satisfactory	Unsatisfactory
Upland Waikato	40.9	18.1	41.0
Waipā River	44.3	25.1	30.5
Lowland Waikato	31.9	23.0	45.1

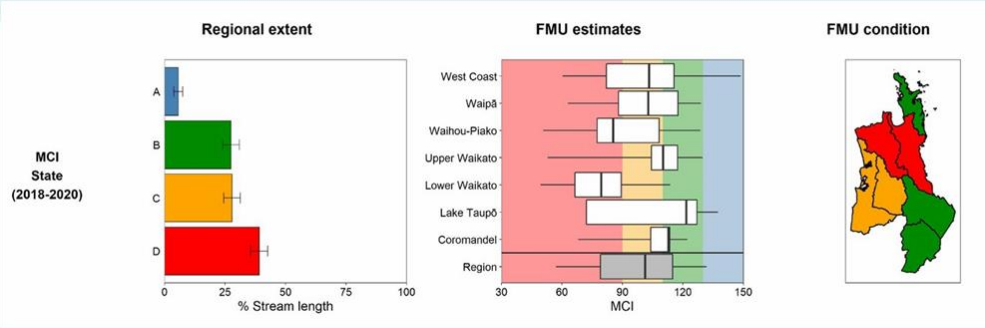
125 Dr Scarsbrook EIC, at [121].

126 Cited by Dr Scarsbrook, at [101]: *E. coli trends in Waikato streams: Exploration of drivers and alternative trend analysis* S Woodward, S Elliot, R Davies-Colley & R Stott (NIWA), Report IS 2022/09, June 2022) at Executive summary, page 9.

[17] The Report stated:[127]

> Many streams of the Waikato region are failing to meet national bottom lines for ecosystem health. More than 50 per cent of streams in developed catchments scored in the worst band for the MCI (Macroinvertebrate Community Index). Contributing to the impact on stream invertebrates is deposited sediment, which can smother animals living on the stream bed. …
>
> Invertebrates that are most dependent on abundant oxygen are given high taxa scores for the MCI. When organic loading is high, and reaeration is inadequate, these high scoring taxa are the first to be lost from the stream. Low gradient streams are more likely to be depleted in oxygen due to low water velocities limiting reaeration, especially when flows are low. Loss of biodiversity for invertebrate communities has been pronounced in our developed lowland streams. The period of record revealed little improvement in invertebrate indices. Reductions in ammonia and phosphorus have not translated to improved MCI scores.

[18] The Report also recorded that:[128]

> Sensitive insects like mayflies will persist in streams only if habitat and water quality is adequate for survival. So invertebrate communities tell us about prevailing conditions, and are scored using the MCI. Areas are coloured blue for best to worst in red (NPS-FM attribute bands).
>
> 
>
>
> …In terms of trends, the period of record revealed little improvement in invertebrate indices. Fencing and planting, plus reductions in ammonia and phosphorus, have not translated to improved MCI scores.
>
> …
>
> Native fish, although more tolerant of reduced water quality than macroinvertebrates, are sensitive to migration barriers such as perched culverts, weirs, floodgates and dams. …

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127 WRC SOE Report, at pages 60 and 63.

128 WRC SOE Report, at pages 61 and 70.

[19] The data in the above paragraph was sourced from WRC's Technical Report 2022/32.[129] In view of its significance to our s 70 evaluation, we considered it necessary to have a more complete understanding of the background, and consider the following additional information particularly relevant:

(a) Median MCI scores ranged from equivalent to B Band in the Upper Waikato, C Band in Waipā and D band in the Lower Waikato and central Waikato FMUs (79.5 in the Lower and Central Waikato FMUs);

(b) Regionally, the MCI for wadeable streams on developed land was estimated to fall within the C Band;

(c) MCI was estimated to be in the D band for around 40% of stream length, which the report states is equivalent to >5,500 km; and

(d) The estimated extent of stream length falling below the national bottom line for MCI, QMCI, and ASPM[130] ranged from 40 – 60% (up to around 8,500 km).

[20] For ease of reference, we record that the MCI B Band is 110 to 130, C Band is 90 to 110 and D Band is less than 90.

[21] Other relevant information in WRC's Technical Report 2022/32 included:[131]

(a) Regionally, for fish communities, based on the National Policy Statement Index of Biological Integrity (NPSIBI) banding for fish, the median condition was B band. For the regionally developed Waikato Quantile IBI (QIBI) for fish <25% of stream length is estimated to be in D band (equivalent to around 3,500 km), while for the NPSIBI <5% was estimated to be D band, reflecting differences in band thresholds between the two methods rather than site specific scores.

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129 M Pingram, B David, N Squires, J Smith and M Hamer: Current ecological state of wadeable streams in the Waikato region 2018-2020, March 2023, TR 2022/32.

130 An aggregation of EPT* richness, %EPT* abundance and MCI standardised to nationally set minimums and maximums (NPS-FM 2020), where EPT means Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).

131 M Pingram, B David, N Squires, J Smith and M Hamer: Current ecological state of wadeable streams in the Waikato region 2018-2020, March 2023, TR 2022/32.

(b) In terms of important stressors to aquatic ecological communities, fine sediment deposition in the form of sand, silt, and clay particles, was identified, with c. 60% of wadeable stream length estimated to have more than 40% streambed cover. Importantly, negative effects on aquatic communities are well-documented to occur when surficial coverage of the stream bed by fine sediments exceeds a threshold of 20%, illustrating the widespread scale and ecological significance of this stressor across the region. With respect to aquatic plants, macrophyte growth was expected to be problematic across >25% of stream length, where they exceeded 40% cover of the bed of a reach, while periphyton was unlikely to be a major issue across most of the wadeable stream network.

(c) While only a relatively small percentage of the sampled stream network had total habitat scores indicative of poor condition, the majority can be considered marginal overall, indicating that aspects of habitat (including fine sediments and riparian condition) are likely to be playing a role in shaping ecological indices at individual sites.

(d) Poor invertebrate indices tend to correlate with broader suboptimal water quality conditions (e.g., deposited and suspended sediment, and nutrient enrichment) in rivers and streams across the region (Pingram et al. 2019; Pingram et al. 2020). With respect to fish, although median values for the regional Waikato QIBI also fell within the C band, and lower scores were associated with higher amounts of fine deposited sediment, fish communities appear to be more tolerant to suboptimal water quality (generally) than invertebrates. In contrast to invertebrates, impaired riverscape connectivity (e.g., perched culverts, weirs, dams) was likely to be a more important factor constraining regional fish diversity across the network.

(e) Measurements of instream plant growth indicate that macrophyte cover is of concern at around 30% of the target network, and it is likely this is associated with low gradient and unshaded streams (Ellawala Kankanamge et al. 2019), with unshaded stream reaches estimated to account for around 50% of the stream network on developed land (Table A 2). Estimates of overall reach habitat conditions (excluding periphyton) indicate that a large proportion of the target stream network conditions are likely to marginal to poor, depending on the combination of answers, with lowest scores often being for the quality of riparian vegetation and fine deposited sediment components. Overall, the extent estimates of ecological condition are similar to those from estimates produced from the same monitoring network in previous rotations (2009-2011, 2012-2014, 2015-2017).

(f) Reversing reach scale degradation is likely to require environmental improvements to occur at entire catchment or sub-regional scales in many cases (e.g., for habitat quality, riparian condition, sediment retention, total nutrients) before local improvements in ecological indices respond (esp. macroinvertebrates.

(g) … given the known sensitivity of invertebrates to nutrient enrichment and sediment, … a combination of factors generally associated with streams flowing through developed landscapes such as reduced shading, increased fine sediment deposition, nutrient enrichment (which promotes algal

growth), higher water temperatures, and reduced habitat quality are likely to be collectively responsible for the median estimated poor-fair (D-C) state of invertebrate communities across much (c. 70% or c. 10,000 kms) of the region's wadeable river network (outside of native forest).

(h) Although the NPS-FM (2020) requires reporting of specific indices for ecological health, as alluded to above, the current indices are likely to lack the sensitivity required to address declines before they have already occurred thus limiting their relevance for effective management. Since different organisms and groups respond differently to different stressors, we propose that a variety of indicators should be used and combined to provide a more complete picture of state and to target relevant stressors more effectively.

E4 Trend Analyses

[22] As noted in Parts A4 and E4, the following analyses draw on work commissioned by the WRA and undertaken by NIWA. We also note here that we include trend analyses for both water quality and ecological indicators in this section for ease of understanding.

[23] NIWA stated that: [132]

> … the water quality and experience indicators analysed generally had larger and more robust datasets, with data gathered monthly or quarterly. The ecological indicators were based on data sets derived from annual sampling, the minimum resolution acceptable for inclusion in the trend analyses.
>
> The trend analyses were conducted on data representing relatively short time periods. Trends derived from ten years' of data (or less) are known to be influenced by both sampling errors (i.e., a limited subset of data not reflecting the entire population) and natural fluctuations in environmental drivers, such as flow and climate cycles, and should therefore be interpreted with caution.
>
> The Regional Ecological Monitoring of Streams Programme includes more than 240 wadeable stream/river sites within the Waikato region, 74 of which are monitored annually.

[24] The summary of key findings and discussion included:

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132 Trends analysis for selected indicators of Waikato River health and wellbeing 2010-2019, prepared by E Graham, F Matheson, E Williams, D Rickard (NIWA) September 2020.

(a) The trend analysis showed a high level of spatial and temporal diversity in improving and deteriorating trends for the 21 indicators where suitable datasets were readily available.

(b) A total of 751 trend analyses were performed across all combinations of indicators and sites, of which 22% (169 of 751) were improving trends, 37% (275 of 751) were deteriorating trends and 41% (307 of 751) were as likely improving as deteriorating trends;

(c) Water quality indicators were dominated by deteriorating trends, with exceptions being improving trends for dissolved oxygen, arsenic, and chlorophyll *a*;

(d) During the current WRA five-yearly reporting period (2015-2019) water clarity, *E. coli* and total nitrogen deteriorated at ≥ 70% of Waikato River sites monitored across all RCUs;

(e) Ecological indicators were dominated by as likely improving as deteriorating trends, but where a trend could be detected with confidence, improving trends were more common than deteriorating trends for seven of the nine indicators;

(f) The dominance of as likely improving as deteriorating trends is perhaps not surprising given the combination of annual sampling frequency and the short time period (5 years) for trend analyses;

(g) Trends were also examined for each RCU[133] individually. In general, trends varied between indicators and time periods, and similar patterns across all indicators within an RCU were not observed. However, some spatial variation was observed between RCUs, with trend patterns

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133 Report Card Units for lengths of the Main stem and tributaries from Huka to Ōhakuri, Ōhakuri to Karāpiro, Waipā Mainstem, Mid Waikato (Karāpiro to Ngāruawāhia) and Lower Waikato (Ngāruawāhia to Te Pūaha), which are used to summarise whether or not certain prescribed values correspond to a healthy state.

more similar within RCUs than between up-river, mid-river, and down-river RCUs;

(h) The trend analysis shows continuing deterioration in the health of the river and its tributaries; and

(i) … we recommend that five-year trends should be interpreted with caution. Ten year trends are more robust, but care should still be taken with regards to ascribing observed changes in trend direction to either natural environmental drivers or anthropogenic activities in the catchment.

[25] The following table is a summary of water quality and ecological indicators trends at Waikato River sites over a five-year period from 2015 to 2019:[134]

Indicator	% deteriorating trend	% improving trend	% as likely improving as deteriorating trend	Number of sites
MCI	23%	33%	44%	27
QMCI	4%	33%	63%	27
% EPT abundance	11%	26%	63%	27
% EPT taxa	26%	15%	59%	27
Periphyton filament cover	0%	28%	72%	25
Periphyton thick mat cover	0%	12%	88%	25
Macrophyte clogginess	8%	28%	64%	25
Exotic macrophytes	0%	28%	76%	25
Native macrophytes	20%	4%	76%	25
Riparian channel shade	12%	16%	72%	25
Riparian vegetation protection	44%	26%	30%	27
Riparian width	33%	23%	44%	27

134 Table I: Summary of Water Quality and Ecological Indicator Trends at Waikato River Sites over a five-year period from 2015-2019: Ecological Indicators, page 6.

[26] The following figure from the NIWA Report[135] provides an overview of trends in water clarity, chlorophyll *a*, E. *coli*, Total Nitrogen and Total Phosphorus for the 10-year period 2010 to 2019. This clearly illustrates the impossibility of attempting to consider effects on aquatic life at anything approaching a fine-grained level of detail.

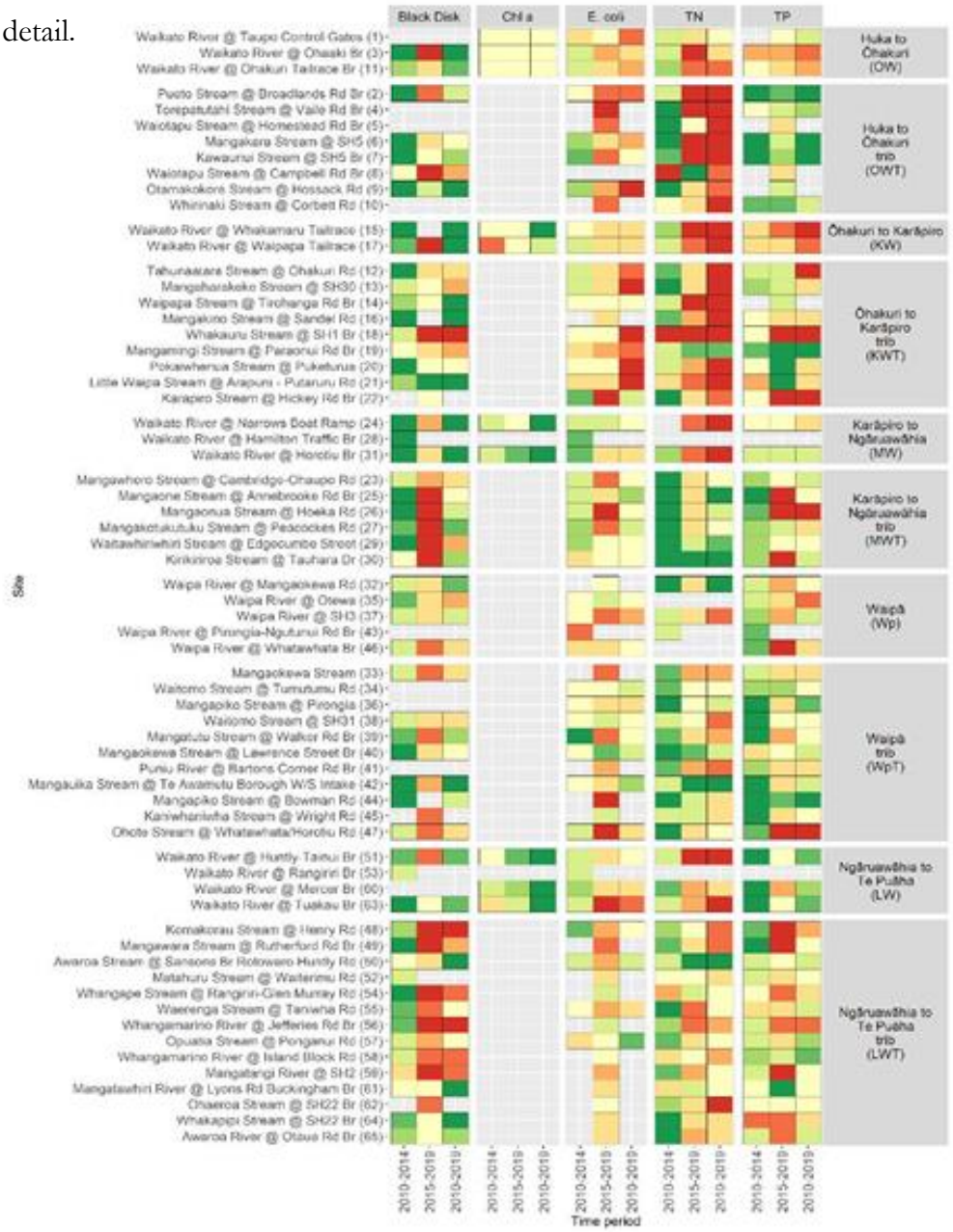

Figure 93: Heatmap plot showing trend confidence and direction for water clarity (Black Disk), Chlorophyll *a* (Chl *a*), *E. coli*, total nitrogen (TN) and total phosphorus (TP) indicators across RCUs. Each cell represents a single site (site names listed down the left-hand y-axis) over a single time period. The colour in each cell represents the confidence in trend direction, with green colours indicating improving trends and red colours indicating deteriorating trends. The darker the colour, the greater the confidence in trend direction. Yellow indicates the trend is as likely improving as deteriorating.

135 Trends analysis for selected indicators of Waikato River health and wellbeing 2010-2019, prepared by E Graham, F Matheson, E Williams, D Rickard (NIWA) September 2020.