BEFORE THE HEARINGS PANEL

IN THE MATTER	of the Resource Management Act 1991 ('the Act')
AND	
IN THE MATTER	of Proposed Plan Change 9 to the Hawke's Bay Regional Resource Management Plan

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EXPERT CONFERENCING JOINT WITNESS STATEMENT TO THE HEARING PANEL – WATER QUALITY

AND ECOLOGY

Introduction

1. This joint witness statement has been prepared at the request of the hearing panel for the Proposed Plan Change 9 of the Hawke's Bay Regional Resource Management Plan.
2. Conferencing meetings were held on 15/6/2021 in two consecutive meetings.
3. Participants were:
   - Ms Catherine Sturgeon and Dr Alexandra (Sandy) Haidekker
   - Dr Michael Greer and Dr Alexandra (Sandy) Haidekker
4. Matters considered are outlined in the tables below with comments on areas that have been resolved and areas that remain unresolved.

Expert conferencing regarding recommended changes by Ms Catherine Sturgeon in Table 1 of evidence.

Expert conferencing regarding recommended changes by Dr Greer in Table 2 of evidence.

Table 1: Expert conferencing regarding recommended changes by Ms Catherine Sturgeon

Paragraph	Recommendations	HBRC response	Agreed target / unresolved	Submitter's comment
6	*Priority maps*			
6a	Remove TN map and replace with DIN map	Disagree	Agreed: Delete TN concentration map. Unresolved: SOE data-based DIN / modelled TN yield map for prioritisation	**AH:** Maps based on SOURCE model TN output are used as priority maps because (1) they provide a better spatial coverage (than the SOE site network) and are therefore suitable for a relative prioritisation based on contaminant loss risk across the TANK catchments. (2) SOE sites reflect local current state at a point in time and is influenced by site specific attenuation factors, making a relative catchment-wide comparison more difficult. TN is a more reliable variable (compared to DIN) for modelling, accounting and estimating load to downstream receiving environments (i.e., DIN mobilisation from the TN pool). I recommend the deletion of the TN concentration map to avoid confusion with SOE data. **CS:** I accept removing the TN concentration priority map. However, I still recommend using a DIN concentration priority map rather than a TN yield map. There are two main reasons for this: 1. To enable usability of the plan in order to achieve the WQ outcomes of the plan. As discussed in my evidence, the priorities should relate to the TAS in Sch 26 and achieving the WQ outcomes and values in Sch 26. 2. TN and TP yield maps identify some hill country sub-catchments as low priority when they should be considered high priority sub-catchments. I have expanded on these points below. Point 1: I am mainly concerned about the implementation of the Plan and how the average horticultural grower or farmer would use the plan. They would use the priority maps to show when FW-FPs are needed to be completed. The FW-

FPs involve assessing and understanding the WQ in their sub-catchment. From there they may discover that what is a priority on the priority maps for their sub-catchment is not actually reflected in the baseline median WQ concentration.

For example: the Tutaekuri-Waimate Stream in Ngaruroro Catchment. It is high priority for TN yield but below Sch 26 guidelines in DIN and all other N parameters. It is low priority in the TP yield map but D band for DRP in Sch 26.

Point 2: I understand that algal growth and macrophyte growth influence DIN concentrations and therefore TN yield may be better for accounting purposes. However there are discrete hill country tributaries that have been modelled as low risk for nutrient yield but are high risk of algal growth for DIN or D band in terms of DRP in Sch 26. Two examples are below.

Poporangi Stream: In Sch 26, DIN conc is at a level that is high risk of algal growth, but the sub-catchment is low priority for TN yield. In Sch 26, DRP is in the D band, but modelled as low priority for TP yield. This sub-catchment is also long-term priority for sediment risk. Therefore the timing to complete FW-FPs in the sub-catchment is 9 years away.

Maraekakaho River: In Sch 26, DIN is moderate risk for algal growth but low priority in TN yield map. In Sch 26 DRP (and *E.coli*) is in the D band, but low priority for TP yield. This sub-catchment is a long-term priority for sediment risk. Therefore the timing to complete FWFPs in the sub-catchment is 9 years away.

I would expect that the sub-catchments that need to improve in terms of the TAS in Sch 26 would be prioritised in terms of the development of FW-FPs.

AH: I acknowledge the issue that some SOE sites indicate water quality states that are not picked up by the modelling for nitrogen, phosphorus and sediment loss risk. However, for the reasons mentioned above I don't agree that we use SOE data instead of modelled priority maps. I understand there is a gap

				between prioritising action based on existing poor water quality and using the model to prioritise action. A solution that could be used is to include tributaries as a priority where Schedule 26 shows they are in the lowest quality band for DIN. I think that the discussion on more information required for the prioritisation of nitrogen management is not a technical matter on water quality and ecology, but rather policy/planning related. **Agreed points:** Remove TN concentration map. **Unresolved**: SOE data-based DIN / modelled TN yield map for prioritisation.
6b	Update TN yield map to match priority table	Agree	Agreed. Amended.	**CS:** I accept, however refer to my points above regarding the TN yield map.
6c	Add a DRP concentration map using Schedule 26 baseline data	Agree in part	Unresolved: SOE-data based DRP / modelled TP yield map for prioritisation.	**AH:** (See TN) We achieve a better spatial coverage (than the SOE site network) for relative prioritisation across TANK catchments by using the SOURCE model TP output. TP is a more reliable variable (compared to DRP) for modelling, accounting and estimating load to downstream receiving environments (DRP mobilisation from TP pool). **CS:** As above for DIN, I still recommend a DRP concentration map rather than the TP yield map. **AH:** It is still my opinion that SOE data-based maps are not suitable for management prioritisation. I acknowledge the issue that some SOE sites indicate water quality states that are not picked up by the modelling and I think a solution could be to include tributaries as a priority where Schedule 26 shows they are in the lowest quality band for DRP. However, I think that the discussion on more information required for the prioritisation of phosphorus management is not a technical matter on water quality and ecology, but rather policy/planning related. **Unresolved:** SOE-data based DRP / modelled TP yield map for prioritisation.

| 6c cont. | Add an *E. coli* NOF band priority map | Disagree | Unresolved. | **AH:** A priority map for *E. coli* is not recommended as the focus on riparian land management and stock exclusion (NPSFM 2020) supports the pathways priority approach to address *E.coli* issues.

CS: I accept HBRC response to leave out the *E. coli* map based on the discussion with Dr Haidekker regarding HBRC faecal source tracking research in the Karamu / lowland areas which implies that waterfowl is one of the prevalent sources of *E. coli* and FW-FPs were unlikely to mitigate for this.

I noted that there were 3 hill country catchments that were D band in Sch 26 for *E. coli* (Mangatutu Stream, Mangaone River, and the Maraekakaho River) and should be captured in the priority maps as *E. coli* in these sub-catchments is presumably not due to waterfowl. The Mangatutu is captured in the TP yield map, the Mangaone River is captured in the priority maps, however Maraekakaho has not been captured in the priority maps and as discussed above in the DIN discussion, this sub-catchment needs to be identified as a high priority. Dr Haidekker has stated that *E. coli* loss to streams will also be mitigated through stock exclusion regulations 2020, indicating that there would be adequate mitigation in these hill country catchments. Following this discussion, I checked the stock exclusion guidelines 2020 and it appears that the regulations do not apply to sheep, which may have implications in the TANK catchments. Please also note that the effectiveness of fencing as a mitigation to *E. coli* loss decreases under high flow conditions.

AH: I agree that high *E.coli* concentrations are not limited to the lowland areas and that *E. coli* in these hill country sub-catchments is presumably not predominantly due to waterfowl.

I think that the discussion on the need for more information required to prioritise management of *E.coli*, given new NPSFM stock exclusion requirements, is not a technical matter on water quality and ecology, but rather policy/planning related. |

				Unresolved.
8a-e	Updating priority maps for clarity			This point was discussed with Dr Haidekker, and recommendations will be put forward to the planning team.
8f	Add in Ahuriri water quality area to TN yield map			**CS:** I accept, however refer to my points above regarding the TN yield map.
8f cont.	Add in Poukawa sub-catchment to TN yield map			**CS:** I accept, this is a work in progress by HBRC. However refer to my points above regarding the TN yield map.

Table 2: Expert conferencing regarding recommended changes by Dr Greer

Areas refer to FWQU in Dr Greer's statement of primary evidence Table 1 abbreviated below as: Area 1: Upper Ngaruroro and upper Tūtaekurī rivers; Area 2: Lower Ngaruroro and lower Tūtaekurī rivers (main stems); Area 3: hill country tributaries; Area 4: Lowland tributaries.

Attribute	Area	Dr Greer's recommended change	HBRC response	Agreed target / unresolved	Expert's comments
DIN	1	Change to 0.1 mg/L (average) from 0.05 mg/L (median)	Disagree	Unresolved	**MG:** Based on conversations through conferencing it has become apparent that the desired outcome of PPC9 is a reduction in nutrient concentrations and (hopefully) a consequential reduction in risk in periphyton blooms. The existing Schedule 26 DIN targets will achieve a reduction in DIN concentrations and should reduce periphyton growth rates. However, for the reasons set out in my primary evidence their applicability to the periphyton targets in the TANK catchments (or anywhere in New Zealand) is highly questionable.
	2	Change to 0.63 mg/L (average) from 0.15 mg/L (median)	Disagree	Unresolved	

It is my view that if the intent of Schedule 26 is to simply reduce nutrient concentrations that this should be explicit in the target, which should be simply read "improving trend". This would allow HBRC to conduct the technical investigations required to develop environmentally meaningful nutrient criteria before the next plan change, while ensuring that nutrient concentrations are still heading in the right direction in the meantime.

If numeric nutrient criteria are included in PPC9 it is still my view that correct numbers from Matheson *et al.* (2016) should be used, as the existing thresholds were never designed to be used for anything else other than inputs into a model.

AH: The guidelines in PPC9 are the best available to meet the objectives defined by the TANK group through the stakeholder process. More lenient targets are inconsistent with the objective to maintain or improve ecosystem health, particularly relating to downstream effects, and reflecting ki uta ki tai.

In my opinion limiting the target to 'improving trend' and deleting numerical nutrient targets doesn't give effect to NPSFM 2020 1.6 (3) that in the absence of complete and

					scientifically robust data best information available must be used, and that decisions must not be delayed solely because of uncertainty about the quality or quantity of the information available. One of the reasons to use the thresholds intended for use in BBN modelling was the availability of both, DIN and DRP thresholds for consistency (the 2016 model results did not have DRP criteria for periphyton cover). Since the DRP attribute was updated to the NPSFM 2020 thresholds in the S42a addendum report this reason became redundant. Based on conversations through conferencing, I now consider changing the PPC9 DIN targets to using the nutrient criteria from Matheson *et al.* (2016) Table 4-6, that are related to periphyton cover (% PeriWCC), as an option to resolve this issue: Area 1 DIN target as 0.035 mg/L and area 2 and 3 targets as 0.14 mg/L. **Agreed points:** Unresolved. However, AH neutral to changing DIN targets to: Area 1: 0.035mg/L ; Area 2 and 3: 0.14mg/L .
	4	Change to reflect current state from 0.444 mg/L (median)	Disagree	Unresolved	**MG:** Based on conversations through conferencing on the need to reduce inputs into the estuarine receiving environment it is my opinion that a 2040 target of "Improving trends" is most appropriate. Long-term outcomes should be consistent with the most up to date guidelines in ANZ 2018. **AH:** The ANZECC guideline in PPC9 was the best available at the time to meet the objectives defined by the TANK group through the stakeholder process. Deleting the target is inconsistent with the objective to maintain or improve ecosystem health, particularly relating to downstream effects. **Unresolved.**
TP	1	Change to 0.014 mg/L (average) from 0.003 mg/L DRP (median)	Disagree	Unresolved	**MG:** In my opinion phosphorus targets in this area should either be TP as suggested in my evidence (as that is the correct use of Matheson *et al.* (2016). Or should be an Improving trend in DRP. More detail provided in box row below. **AH:** Dissolved nutrient targets are commonly used to address periphyton growth in hard-bottomed streams. In PPC9 TP is not considered to manage periphyton growth,

					but is in Schedule 26.5 for the receiving environment, the Waitangi estuary. In my view targets set for periphyton growth should remain as DRP (and DIN). TP of 0.014 mg/L relates to periphyton biomass (Chl-a), not periphyton cover, and is therefore inconsistent with the periphyton attribute used in PPC9. **Unresolved.**
DRP	2	Change to 0.011 mg/L (average) from 0.01 mg/L (median)	Disagree	Unresolved	**MG:** Based on conversations through conferencing it has become apparent that the desired outcome of PPC9 is a reduction in nutrient concentrations and (hopefully) a consequential reduction in risk in periphyton blooms. The existing Schedule 26 DRP targets will achieve a reduction in concentrations and should reduce periphyton growth rates. However, for the reasons set out in my primary evidence their applicability to the periphyton targets in the TANK catchments (or anywhere in New Zealand) is highly questionable. It is my view that if the intent of Schedule 26 is to simply reduce nutrient concentrations that this should be explicit in the target, which should be simply read "improving trend". This would allow HBRC to conduct the technical investigations required to develop environmentally meaningful nutrient criteria before the next plan change, while ensuring that nutrient concentrations are still heading in the right direction in the meantime. If numeric nutrient criteria are included in PPC9 it is still my view that correct numbers from Matheson *et al.* (2016) should be used, as the thresholds in the notified version were never designed to be used for anything other than inputs into a model. Consequently, simply translating them directly into NPSFM attribute states is also not appropriate. **AH** The DRP targets have been updated to NPSFM 2020 thresholds in the S42a addendum report: A band for the upper Tūtaekurī and Ngaruroro and B band for all other areas. This is consistent with the objectives defined by the TANK group through the stakeholder process as laid out in my statement of reply evidence. Additionally, it incorporates downstream effects, ki uta ki tai. I consider this update an improvement

					to the previous targets, as they relate to algal and aquatic plant growth in all TANK areas, as well as ecological communities and ecosystem processes. They therefore better reflect overall values identified by the TANK group compared to the previous targets in PPC9. **Unresolved**.
	4	Change to reflect current state from 0.01 mg/L long-term (median)	Disagree	Unresolved	**MG:** Based on conversations through conferencing on the need to reduce inputs into the estuarine receiving environment it is my opinion that a 2040 target of "Improving trends" is most appropriate. Long-term outcomes should be consistent with the most up to date guidelines in ANZ 2018. **AH:** I consider the update to NPSFM 2020 thresholds as appropriate and even an improvement to previous targets because the DRP attribute includes thresholds related to aquatic plant growth for this lowland area 4. The target is consistent with TANK group's objectives and incorporates downstream effects, reflecting ki uta ki tai. **Unresolved.**
Temperature	All	Delete	Agree	As in S42a addendum	Agreed
Turbidity	All	Delete	Agree	As in S42a addendum	Agreed
pH	All	Delete	Agree	As in S42a addendum	Agreed
E.coli	1	As per NPSFM 2020	Agree	As in S42a addendum	Agreed
	2	As per NPSFM 2020	Agree	As in S42a addendum	Agreed
Deposited sediment	1	Delete seasonal objective of 15% cover for salmonid spawning	Agree	As in S42a addendum	Agreed

	4	Delete for naturally soft-bottomed streams	Agree	As in S42a addendum	Agreed
Periphyton biomass	2	Amend to ≤120 mg Chl-a/m^2	Agree	As in S42a addendum	Agreed
Periphyton biomass	1	Add to ≤50 mg Chl-a/m^2 in addition to Periphyton cover <20% PeriWCC	Disagree	Unresolved	**MG:** It is still my view that periphyton biomass target attribute states should be set for all sites identified in Schedule 26 as it is a compulsory attribute. However, it has become clear to me through conferencing that HBRC do not consider all of the thresholds set out in Schedule 26 to be NPSFM target attribute states. Instead, the numbers for some sites are included simply to provide context. In my opinion, the sites in schedule 26 that HBRC consider to sit outside the NOF should be shifted into a new schedule that explicitly states the purpose of the numeric thresholds (context). Sites included in such a schedule would not need to have target attribute states for periphyton biomass as they would. As set out in my statement of primary evidence it is my opinion that periphyton biomass can be assessed via estimates of periphyton cover as per the NPSFM 2020. Accordingly, this approach would not increase the monitoring requirements of council. Furthermore, the existing cover targets can be retained. **AH:**. SOE sites in Schedule 26 are not FMU sites and therefore don't require all attributes of the NOF. Nevertheless, periphyton is additionally monitored as visual periphyton cover at all hard-bottomed SOE sites and targets are set for this attribute. It is my view that this is a correct way to give effect to the NPSFM. I do not agree that SOE site information on baseline state should sit outside of Schedule 26. It is my opinion that their inclusion in Schedule 26 increases transparency and usability of the plan. Schedule 26 is not limited to a NOF attribute table: it includes the required NOF attributes, but is going beyond by including additional attributes relevant to values identified by the TANK group through the stakeholder process. Therefore, it is my opinion that Schedule 26 should retain its current structure.
	3	Add ≤120 mg chl-a/m^2 in addition to Periphyton cover <30% PeriWCC	Disagree	Unresolved	

					Unresolved.
Cyano-bacteria	All	Delete existing < 20% cover target	Disagree	Unresolved	**MG:** It is still my view that there are no robust of defensible guideline values that can be used as target attribute states in a regional plan. The Cyanobacteria target in schedule 26 is an interim "alert level" set to guide a public health response to individual bloom events. As covered in my evidence it is not suitable for a long-term target attribute state. Furthermore, as the drivers of cyanobacteria growth are still largely unknown, the management actions required to achieve such an outcome are unknown.

In my opinion if a threshold was to be included the "action" threshold (50% cover) from the 2009 interim guidelines would represent the best available. As below that level there is no requirement to notify the public of a potential risk to health.

AH: The cyanobacteria target is only used in relation to triggering alert levels under MfE framework for cyanobacteria and relates to policy 16. I agree that drivers for cyanobacterial blooms are largely unknown, but since the attribute doesn't trigger management actions, I don't agree deleting the attribute from Schedule 26 would improve Schedule 26.

The MfE benthic cyanobacteria alert mode of 20 – 50% cover does not require but recommends providing the public with information on the appearance of mats and the potential risks.

The inclusion of this attribute in schedule 26 reflects the values and outcomes identified by the TANK group through the stakeholder collaborative process.

Unresolved. |
| **Macrophytes** | 4 | Delete existing < 50% CAV target | Disagree | Unresolved | **MG:** It is still my view that there are no robust of defensible guideline values that can be used as target attribute states in a regional plan. The macrophyte target in schedule 26 is a provisional guideline that requires significant refinement.

Given that macrophyte cross-sectional area is not an NPSFM compulsory attribute there is no requirement to include a target for it in schedule 26. However, I do note |

| | | | | | that it is significant driver of degraded ecosystem health in the Karamu catchment and that improvements are needed to meet other schedule 26 targets. As such it is my view that a target of "improving trends" would be most appropriate.

If an absolute numeric for macrophyte growth was to be included in schedule 26, I concede that the 50% CAV currently listed is the best available. However, this does not mean that it is relevant to the streams in the TANK catchments of defensible.

AH: Macrophytes and subsequent periods of low DO are a critical element for ecosystem health in lowland streams and are key to managing the poor ecosystem health in this area. The provisional guideline is the best available (as per NPSFM 2020 1.6). In my opinion the 50% target should be retained as a target for improved ecosystem health in lowland streams.

Unresolved. |
|---|---|---|---|---|---|
| **Macro-invertebrat es** | 4 | Only stipulate MCI-sb for naturally soft-bottomed streams | Agree | As in S42a addendum (agreement only related to MCI and QMCI) | Agreed. |

Date: 18/6/2021

Dr Alexandra Natalie Haidekker   Catherine Jean Sturgeon   Dr Michael John Crawshaw Greer