BEFORE THE HAWKE'S BAY REGIONAL COUNCIL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of an application by various applicants ('applicant group') for taking and use of Tranche 2 Groundwater from the Ruataniwha Basin

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JOINT WITNESS STATEMENT FOLLOWING CONFERENCING OF FRESHWATER ECOLOGY EXPERTS

18 October 2022

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1. This joint witness statement has been prepared as part of expert conferencing on the topic of freshwater ecology and related effects relating to the applications for resource consents made by the Applicant Group to Hawke's Bay Regional Council (**HBRC**). The applications relate to proposed abstraction of groundwater from the Ruataniwha Basin for use to irrigate land and for augmentation of rivers and streams.

2. The expert conference was held on 18 October 2022 via conference call. The focus of this conferencing was the nature, extent and scale of the predicted effects of groundwater abstraction and proposed augmentation discharges on streams, river and wetlands across the Ruataniwha Basin.

3. The experts who attended the conference were:

   (a) Laura Drummond, PDP, for HBRC

   (b) Vaughan Kessing, Boffa Miskell, for the Applicant Group

4. This joint witness statement is prepared in accordance with section 4.7 of the Environment Court Practice Note 2014.

5. It is confirmed that all attendees have read the Environment Court Practice Note 2014, and agree to abide by the Code of Conduct.

6. This joint witness statement sets out:

   (a) those matters which are agreed between the experts;

   (b) those matters which need to be addressed prior to the hearing that require further information; and

   (c) those matters which are not agreed and the reasons in each case.

7. The Panel's Minute #1 (22/9/22) directed that expert conferencing include the following relevant topics:

   (a) *Effects on flows, water quality and ecology of surface water bodies potentially affected by the proposal, including how the augmentation regime could operate and how effective it might be.*

   (b) *Effects on any natural wetlands potential affected by the proposal.*

8. Further items have been added to the table below within the scope of the topics suggested by the panel.

Dated 19 October 2022

Ms Laura Drummond

Dr Vaughan Keesing

	Issue/question	Matters agreed	Further information required prior to the hearing	Matters not agreed (with each expert's view and reasons)
Existing environment				
1.	The aquatic fauna of the western small streams (those at and west of SH 50) is simple and robust, adapted to a range of current land use and water quality and quantity stressors	Agreed that • Many of the small watercourses have a simplistic aquatic fauna adapted to impacted conditions. • Simplistic communities are robust to change. • There is limited data on the aquatic communities, including fish communities, of small streams within the affected area.		
Flow effects – small streams				
2.	Use of 1 March as a 'typical summer' is appropriate.	It was agreed that further information on the data behind the 'new 1 March (average summer) & 13Mm/yr take (mm)' column in Table 1 is required to understand the veracity and relevance of the new predicted draw down figures.	Dr Keesing will request further information from Mr Weir. Mr Weir has responded with: for the original assessment he took the drawdowns from the model on the individual days of	

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			the worse year (March 2011), for the new assessment he took the drawdowns from a more average year (as per records) of March 2001. 1 March 2011 was therefore chosen to represent an extreme summer and 1 March 2001 to represent a more average summer. Mr Weir did not use multiple days in any form of averaging. Further clarification is still required on this topic.	
3.	Water level (depth and wetted width) in the water body is the most relevant habitat parameter next to	Agreed. Recognising the wide range of sites that needed to be assessed, we agree this was the most practical option in the time available and provides an		

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	velocity. Flow and flow change is a proxy for those physical conditions.	overview of the potential reduction to dominant aquatic habitats (riffle, run, pool). We agree that this type of assessment generally needs more than one-off surveys to provide an accurate representation of reach scale water level, in particular over the summer low flow season.		
4.	The effects on small streams are (as presented in Table 1) small and tolerable and unlikely to result in any significant effects on aquatic habitat, or ecosystems.	We agree that effects (water level reduction and increased drying) to smaller surface watercourses within the basin will occur. We agree that the magnitude of these effects is uncertain, as the long-term temporal water level patterns for small streams is unknown. As shown in Table 1, we agree that some sites will undergo more pronounced drawdown and therefore water levels in differing habitat types will reduce, while the duration of drying		Dr Keesing considers that the predicted drawdown will not have a significant adverse effect of the ecological values of the small streams, Ms Drummond does not consider that sufficient evidence has been provided to support this and further information, such as ecological surveys of sites that have the highest modelled impacts could provide assurance that the effect will be less than minor.

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		in ephemeral or intermittent streams will increase.		
5.	Stream habitats are not likely to experience any dramatic changes.	We agree that many small streams in the drawdown area are already impacted and that any further drawdown will likely add to cumulative drying effects.		Dr Keesing considers (based on his field work observations) that the result of the drawdown will not have a significant adverse effect of the ecological values of the small streams, Ms Drummond does not consider that sufficient evidence has been provided to support this, as drawdown estimates in Table 1 show reductions and drying of riffles and pools in many stream reaches and large drawdown of refugia habitat (pools). Without details on the current ecological values at these specific sites, including fish presence and migration pathways, it cannot be said that dramatic changes will not occur.

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6.	The new stream depth change analysis with the revised modelling portrays a less adverse instream condition in general and especially so for most of the neutral and gaining reach areas. The losing reaches (the western small streams) while experiencing less depletion will still continue to experience an increased draw down.	We agree.	Further information is requested on the exacerbation of drying for the previous worst-case scenario (new analysis suggests 1-3 days either side of current drying).	Ms Drummond considers that the depth change predictions (both original and new) are underestimated as the average depths measured in March 2022 were not characteristic of seasonal low flows. Dr Keesing still considers the measures made when they were made are sufficiently informative to see the pattern of change likely.
7.	The addition of 1 weeks drying in already intermittent systems experiencing typically an assumed 9 weeks annual surface dry conditions is too small a magnitude of change to result in anything but minor alteration to the communities (robust as they are) present.	We agree that a small increase in drying duration in a reach in which drying already regularly occurs is unlikely to result in anything but minor alteration to the communities present.		Ms Drummond and Dr Keesing discussed that the 9 week annual drying period for small streams is not based on evidence, but on landowner comments/experience and cannot be validated. Ms Drummond considers long term water level data should have been collected to provide

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				evidence of the level of intermittency in these small streams.
Hypopheric zone				
8.	No changes to the hyporheic zone are anticipated given the modelled draw down and flow changes.	It is agreed that hyporheic zone drawdown will occur, in line with the predicted surface water drawdown. It is also agreed that hyporheic zone communities in the western hill-fed areas are likely of better condition than those in the lowland area. We agree that impacts to the hyporheic zone will be lower than that in the surface water environment, with only areas where surface drying occurs being impacted. We agree there could be changes to the hyporheic zone where surface drying occurs, but this will be low level and is not likely to result in a significant adverse effect.		Dr Keesing considers that while there is no survey data to prove this, a poor/ robust hyporheic community is likely present that will sustain change. Ms Drummond does not consider that there is enough survey data to determine this.

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9.	That it is unlikely that the hyporheic zone in affected reaches, those that suffer reduction below the surface, will be significantly more affected than they already are and it is unlikely that any additional work could better reflect the possible impact	Agreed.		
Survey period – small streams				
10.	The survey results are in a period of "normal" stream depths because the main rivers were running at typical season flows at survey (despite a generally wet summer) and are sufficient to at least indicate the likely aquatic habitat changes caused by the potential surface water draw down.	We agree that due to the unseasonably wet summer elevating shallow groundwater levels, despite the larger rivers running at normal base-flows (not typical March low flows), spring-fed smaller streams were likely to have been at higher-than-normal baseflows and not at seasonal low flow levels.	While this cannot be completed prior to the hearing, we discussed potential surface water level monitoring over the 2022/23 summer season to calibrate the predicted water level reductions. Water level recorders could be installed at all sites that show a drawdown of more than	Ms Drummond considers that 'normal' stream conditions are not representative of summer low flows and therefore the average water levels provided in Table 1 do not provide the worst-case scenario of predicted surface water drawdown. Dr Keesing is of the opinion that while the measures do not provide a view of the worst case scenario, they are sufficiently informative of a

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			20% to confirm the model prediction outcomes.	typical and late summer period, which is where the abstraction of early summer may be being expressed due to the lag in draw down effect.
Wetlands				
11.	The wetlands identified (by the applicant's survey) are mostly created wetlands for recreation and amenity (duck shooting) and can be excluded via the NPS exclusions. Mr Singer's wetland map is a map of potential wetlands without any ground thruthed certainty. The applicant's survey was a ground truthed survey of wetlands that the applicants are aware of covering the majority of the application effect area and provides a suitable basis for considering the effects of the takes.	We agree on these points, Dr Keesing has discussed the map with Mr Singer and they are in agreement that the HBRC map of potential wetlands is a high-level desktop assessment. We agree that there is a low likelihood that any natural wetlands were missed in the Applicants assessment of the modelled drawdown area.		Inglis Bush wetland is discussed in the following section.

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	Dr Keesing's "natural" wetlands and most features of Mr Singers map are either in the gaining (eastern) reaches and so like those identified in the AEE are deep and stable or else outside the area of the effect of the T2 takes. It is unlikely that there will be unrecorded natural wetlands suffering significant loss of water and condition.			
Inglis Bush				
12.	The forest is not substantively a wetland forest because it is predominantly non-wetland forest species. That this change in canopy condition of those particular species has been occurring for a number of years and a range of activities	We agree that Dr Keesing's site visit indicates Inglis Bush is predominantly a broadleaf forest, not a wetland forest. Previous investigations (Watt, 1997[1]) have shown a range of potential factors impacting the health of Inglis Bush, including physiological drought.	No springs or wetlands were observed by Dr Keesing on his site visit with a neighbouring landowner. Clarification as to the current and/or past presence or spring heads is requested so that a site	

[1] Watt, J.P.C., 1997. Inglis Bush Scenic Reserve (Central Hawkes Bay): Impact of water race on native vegetation. Conservation Advisory Science Notes No. 140, Department of Conservation, Wellington.

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	related to the water in the forest have been in play. a) There is no evidence for any one factor affecting the kahikatea's apparent die back. b) Nor given the most water sensitive trees may already be dead or near dead, is there any evidence or expectation that the deep aquafer take will affect Inglis bush's shallow ground water and so forest.	During caucusing the Inglis Bush wetland was discussed, this wetland was not included in the original assessment and was not visited (the bush was walked longitudinally). This area is not shown in Mr Weir's drawdown contours. We understand that there is a range of possible impacts and only a single set of drawdown impacts are shown on the contour maps, we therefore consider that there could be a potential drawdown effect on this wetland and this should be investigated further.	visit can be undertaken prior to the hearing.	
Riparian Vegetation				
13.	Riparian planting (as proposed in the applicants suggested consent conditions) will improve biodiversity values and provide shading but won't mitigate the effect of stream drying and may not survive dry conditions	We agree that riparian planting of many of the small streams will not provide meaningful ecological mitigation and may cause additional water reductions through root uptake (transpiration).	An updated mitigation proposal from the applicant for the effects of small stream drawdown.	

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		Ecologically meaningful mitigation was discussed during caucusing, where it was agreed that mitigation should be focused on degraded stream reaches that have perennial or low level intermittency, reaches that have degraded ecological value, or values that could be enhanced such as spawning reaches or At-Risk fish migration pathways (i.e. Tukipo tributaries).		
Augmentation				
14.	Prior to stream augmentation the quality of the bore water to be discharged needs to be understood and compared to the receiving environments. If agreed: a) what are the critical parameters to be monitored and limits that should be applied?	Agreed. Water quality parameters should be developed with limits and triggers to support discharges. If the augmentation water cannot meet these limits, it should not be discharged to surface water.	The Applicant will develop an augmentation water quality monitoring programme, to ensure that water quality is of the same or better quality than that of the receiving environment. This monitoring programme will have specific parameter limits	

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	b) What other requirements are there to ensure discharged groundwater is suitable eg oxygenation.		that must be met prior to discharge occurring and a set of triggers that outline clear actions if limits are not met. This plan should be approved by HBRC prior to augmentation being initiated, with a baseline water quality run completed as soon as practicable.	
15.	Is augmentation ecologically appropriate, how effective may it be?	From an ecological perspective, to be used as a mitigation or offset, augmentation needs to be at sites that will provide ecological gain. In effect, this is in perennial waterways that are suffering drawdown. Discharging augmentation water to ephemeral or intermittent reaches will result in unintended impacts such as disruption	Confirmation from the Applicant (where augmentation is proposed to mitigate effects) that the augmentation discharge sites are at perennial reaches suffering drawdown, not at ephemeral/intermittent	

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		of species lifecycle patterns, loss of connectivity and fish passage etc.	sites where loss to ground will rapidly occur.	
16.	Augmentation volumes are sufficient in up to a 1 in 10 year event. In more extreme events, augmentation will cease and adverse effects on flows will be worse during period of lowest flow. This is expected to be significant/not significant.	We agree that during this 1 in 10 year event, there will be flow and water level reductions in the larger, augmented streams. We agree that we cannot comment on the significance of this flow reduction, as this is also tied into the location of the augmentation discharge which creates uncertainty in the level of effects.		