Before the Hearings Panel
At Wellington

Under	the Resource Management Act 1991
In the matter of	an application for resource consent to discharge contaminants to land, air and water associated with the proposed long term upgrade and operation of the Featherston Wastewater Treatment Plan
Applicant	**South Wairarapa District Council**

STATEMENT OF EVIDENCE IN REPONSE OF DR OLIVIER MICHEL NICOLAS AUSSEIL (FRESHWATER QUALITY AND ECOLOGY)

ON BEHALF OF GREATER WELLINGTON REGIONAL COUNCIL

10 May 2019

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1. INTRODUCTION

1.1 My name is Olivier Michel Nicolas Ausseil (pronounced "O-Say").

1.2 I am Principal Scientist – Water Quality at Aquanet Consulting Ltd, a water quality and ecology consultancy based in Palmerston North and Wellington. My qualifications, experience and role in the process were set out in my original statement of evidence (dated 1 March 2019) and I do not repeat them here. I also confirm the contents of my original evidence and only note below issues where I considered it useful to provide a response to evidence provided.

1.3 My evidence is given in relation to the application for resource consents for the discharges from the Featherston WasteWater Treatment Plant ('**FWWTP**') lodged by South Wairarapa District Council ('**SWDC**').

2. CODE OF CONDUCT

2.1 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note. I agree to comply with this code of conduct. Except where I am relying on evidence of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

3. SCOPE OF EVIDENCE IN RESPONSE

3.1 My evidence in response addresses the following matters:

(a) Response and comments on the evidence of Mr Graham McBride (public health risk), Ms Emma Hammond (Water quality) and Mr Keith Hamill (Freshwater Ecology) on behalf of SWDC;

(b) My commentary on the consent conditions proposed by SWDC: version dated 3 April 2019, provided as Part C of Mr Sven Exeter's

evidence. This review is made in the context of the issues and concerns raised in their evidence by Mr Irvine and Perwick with regards to the discharge regime and potential implications for water quality and freshwater ecology.

4. EVIDENCE OF MR GRAHAM MCBRIDE

4.1 In paragraph 12 of his evidence, Mr McBride refers to a proposed condition[1], which requires UV treatment (and associated standards) for discharges of up to 140 L/s, and allows any discharge flow in excess of 140 L/s to be discharged with no UV treatment.

4.2 I have not seen in Mr McBride's evidence any specific assessment of potential risks to water users associated with the non-UV treated "high-rate" (i.e. in excess of 140L/s) discharge. I expect this type of high-rate discharge to be infrequent at most, and likely associated with high flow events in the stream, thus probably of no great public health concerns to water users of the stream. However, given that the ultimate receiving environment is a lake, and therefore accumulative in nature, it would be useful if Mr McBride could provide a commentary on the potential effects on recreational water users of Lake Wairarapa in the days/weeks following a non-disinfected discharge from the FWWTP.

4.3 Mr McBride's assessment is centred on public health risks to recreational users of Lake Wairarapa, and does not comment specifically on health risks to recreational users of Donald Creek, or Abbot Creek/ Otauira Stream. Whilst primary contact (e.g. swimming) does seem unlikely in either stream due to their shallow nature, it seems difficult to discount any secondary contact use (e.g. fishing, eeling, playing) of these streams. It would be useful if Mr McBride could provide a commentary on the health risks to

[1] Exeter Evidence, Part C (3 April 2019). Proposed condition 5, Schedule 2, p18.

secondary contact water users in Donald Creek and Abbot Creek/ Otauira Stream.

5. EVIDENCE OF MS EMMA HAMMOND

5.1 In paragraph 68 (Table 7), Ms Hammond indicates that effects of the discharge on in-stream dissolved oxygen is currently minor, albeit subject to monitoring confirmation. I disagree with this assessment. Whilst data are too limited to provide a quantitative assessment of the severity of effects on dissolved oxygen, a degree of detrimental effects on diurnal minimum DO concentrations is expected (WQJWS, Table 1, page 8). Given the evidence of significant organic deposition and periphyton growth and the presence of heterotrophic growths ("sewage fungus") in summer downstream of the discharge, I expect the current effects of the discharge on DO are most likely more than minor, and probably quite severe at times. That being said, effects on in-stream DO are expected to reduce significantly as soon as stage 1B is implemented.

5.2 In paragraph 69, Ms Hammond notes she has assessed the effects of the discharge in relation to the upstream water quality, i.e. a situation in which the current discharge was not occurring. I can confirm that this is also the approach I have taken, and that Mr Hamill, Ms Hammond and I have taken in the WQJWS. In my experience, the effects of point source discharges are always assessed against the "existing environment", which specifically excludes the activity consent is being sought for (i.e. the discharge as it exists).

6. AMMONIACAL NITROGEN PREDICTIONS - EVIDENCE OF MS EMMA HAMMOND AND MR KEITH HAMILL

6.1 In Paragraph 59, Table 6, Ms Hammond provides a summary of predicted total ammoniacal nitrogen median and 95th percentile concentrations in Donald Creek downstream of the FWWTP discharge, during the various

stages of the proposal. A note below Table 6 indicates that the source is Appendix 8 (Table 36) of the 2017 application, i.e. Mott MacDonald's water quality assessment report.

6.2 In his paragraph 60 and Table 3, Mr Hamill presents outputs of additional modelling he has undertaken of total ammoniacal nitrogen concentrations downstream of the discharge. It is notable that the median concentrations predicted by Mr Hamill are significantly lower than those calculated by Mott McDonald and reported by Ms Hammond. For example, for Stage 1B, Mr Hamill predicts a median concentration of 0.064 mg/L, whilst Ms Hammond's number is 0.290 mg/L.

6.3 Upon closer examination, it seems that Table 36 of Mott MacDonald's report provides median concentrations in relation to the existing (measured and modelled) scenario, but mean (average) concentrations in relation to future scenarios 1A to 2B – this in spite of the table's heading referring to median and 95th percentile concentrations.

6.4 It thus appears that the various assessments of potential effects during future stages relative to median ammoniacal nitrogen concentrations, including the assessment reported in the WQJWS, have in fact been undertaken on the basis of mean instead of median concentrations.

6.5 Given the intermittent nature of the discharge, and thus its effects on ammoniacal-N concentrations, the overall median concentration is likely to be significantly less than the average concentration. This means that the assessments of potential effects during future stages relative to median ammoniacal nitrogen concentrations were environmentally conservative (i.e. overstated the risk of effects).

6.6 I note that this only concerns the risk of effects associated with median concentrations and does not affect the assessment undertaken on the basis of peak (95th percentile) concentrations, which are more problematic for

the FWWTP discharge. I discuss this further in relation to Mr Hamill's evidence.

7. EVIDENCE OF MR KEITH HAMILL

7.1 In paragraphs 78-80 of his evidence, Mr Hamill discusses the classification of Abbott's Creek/Otauira Stream and Donald Creek. I agree there is an inconsistency in the pNRP between Schedule F1, which classifies Abbotts Creek and all its tributaries as rivers with significant indigenous ecosystems for high macroinvertebrate community health and as habitat for indigenous threatened / at risk fish species, and Maps 13a and 13b, which do not show Donald Creek as "significant". The maps only show Abbots Creek/Otauira Creek as being significant from the confluence with Donald Creek and upstream. This inconsistency is also noted in the WQJWS (p11).

7.2 I also agree With Mr Hamill (at paragraph 79) that Donald Creek currently does not meet the MCI Objective 25 for "Significant Rivers" (a score of 120). However, Abbots Creek/Otauira Stream does not meet it either: based on data collected in October and November 2016, the MCI score upstream of the confluence was between 90 and 100 on both occasions[2]. There does not seem to be, however, any questions raised as to the applicability of the MCI Objective 25 for "Significant Rivers" to Abbotts Creek/Otauira Stream upstream of the confluence with Donald Creek. The fact that an objective is currently not met is not a valid reason to conclude that the objective does not, or should not, apply.

7.3 I also note that the Objective 25 MCI thresholds were determined on the basis of a mix of monitoring data and modelled "current" and "reference" state (Clapcott and Goodwin 2014)[3] . The predicted "current" MCI score in the reach of Donald Creek upstream of the Featherston WWTP discharge is 88 is and the predicted "reference state" MCI is 127. The predicted current

[2] Refer to Mr Hamill's evidence, Figure 2.
[3] Clapcott, J.E., Goodwin, E., 2014. Technical report of Macroinvertebrate Community Index predictions for the Wellington Region (Cawthron Report No. 2503). Cawthron Institute, Nelson, New Zealand

state matches very well with the average MCI scores measured upstream of the discharge (88.3, with a range of 69-98). The comparison with the reference state confirms the relatively degraded state of Donald Creek upstream of the discharge under the current situation. The "reference state" value of 127 indicates however that a score of 120 is by no means unattainable (albeit likely to require significant restoration of riparian margins and mitigations of land use effects).

7.4 The situation is however somewhat different with regards to periphyton. Whilst data are scarce to say the least, what data exist do not point to the Objective 25 periphyton objective for "Significant Rivers" (periphyton biomass not to exceed 50 mg/m^2) being currently exceeded in Donald Creek upstream of the discharge.

7.5 With regards to paragraph 80 of Mr Hamill's evidence, it is my understanding that Abbots Creek and Otauira Stream are the same stream. For example, a number of maps in the Application show the name "Abbotts Creek" on the reach of stream immediately adjacent to, and downstream of, the FWWTP (e.g. Figures 8 and 17 of the AEE). It also seems that Greater Wellington's resource consent documents refer to "Abbotts Creek" in relation to the lower reaches of the stream (refer to Table 11 and Figure 17 of the AEE). This is inconsistent with Mr Hamill's view that the stream would only be called Abbotts Creek upstream of Featherston.

7.6 I do not have clear technical evidence to guide how Donald Creek should be classified. Given the inconsistency in the pNRP, I requested advice from Greater Wellington's policy team as to how the plan should be interpreted, as explained in paragraph 4.4 of my March 2019 evidence.

7.7 In paragraph 83, Mr Hamill disagrees with my conclusion that significant increases in periphyton are likely to occur when flow conditions are sufficiently stable, saying that this is not supported by actual observations. I disagree. As indicated in the WQJWS (on p22), the November 2016 survey,

due to its timing, provides a good representation of likely effects in spring during stage 1B. During that survey, there was a significant (more than double) increase in periphyton biomass, from 40-48 mg/m^2 upstream to 98-119 mg/m^2 downstream of the discharge. In my opinion, the more than doubling in periphyton biomass measured on that occasion can certainly be qualified as a significant increase.

7.8 In paragraph 43 of his evidence, Mr Hamill discusses the frequency of discharges to Donald Creek when the dilution rate is less than 1:15 at different stages of the proposal. In paragraph 66, he discusses the proportion of time the discharge will be no more than 1:10 during stage 1B. In paragraph 70, Mr Hamill discusses the occurrence of "discharges with low dilution (<15 times)" during Stage 2A.

7.9 It is important to note that dilutions of 1:10 or 1:15, or even 1:20 are, generally speaking, rather low dilution rates for a discharge of treated wastewater to water, and should by no means be seen as being "safe".

7.10 To provide some context, a general rule of thumb for discharges of oxidation-pond treated wastewater to water, is that a minimum dilution of 1:30 should avoid most significant adverse effects; a dilution of 1:50 is considered environmentally conservative. The recently granted discharge permit for the Carterton WWTP discharge to the Mangātarere Stream requires minimum dilution ratios of 1:50 for most discharges and 1:30 for discharges at stream flows above 3 time the median flow.

7.11 In my opinion, discharges to the stream with a dilution rate of less than 1:10 are highly risky environmentally[4] and should be avoided. Discharges with a dilution rate of less than 1:15 are, in my opinion, still problematic and should be minimised as much as possible. I note that condition 11, schedule 2 requires the establishment of a telemetered flow recorder to

[4] For example refer to the WQJWS p19 – the risk of exceeding 33% change in water clarity is high when dilution is less than 1:10

continuously monitor stream flow in Donald Creek. There is thus no practical obstacle to real-time management of discharge rates to avoid, or minimise discharges with low dilution rates. I discuss this further in paragraph 8.8.

7.12 In paragraph 56 of his evidence, Mr Hamill states that the current total ammonia measured in the discharge meet the NPSFM bottom line value. I do not understand the basis of this statement, but believe it to be incorrect. The NPSFM defines as "National Bottom Line" annual median and maximum concentration not exceeding 1.3 and 2.2 mg/L respectively. The median and 95th percentile total ammoniacal nitrogen concentrations in the discharge are currently 4.4 and 11.5 mg/L respectively[5]. This is much more than the NPSFM "National Bottom Line".

7.13 I am yet to review in detail Mr Hamill's re-modelling of predicted ammoniacal nitrogen concentration downstream of the discharge; however, I have briefly discussed his methodology with him and am satisfied that his methodology appears sound.

7.14 I note that Mr Hamill has now recommended that a pH correction to a pH of 7.9 should be applied. I do not have any reasons to strongly disagree, but do note that pH data for the stream is limited to monthly "spot" measurements, and care should be taken when using limited datasets. This is one of the reasons why a pH of 8 was selected for the assessment in the WQJWS.

7.15 Mr Hamill has also recommended a temperature correction to a temperature of 14°C, being the 90th percentile of temperature in May-October. The May-October period was selected on the basis that "during Stage 1B, 90% of occasions when total ammonia exceeds 0.46 mg/l are in the period May-October (Para 52). Because the assessment is focused on

[5] Steve Couper Evidence, Table 3.

peak ammonia concentrations, I do not agree that the shoulder periods e.g. November-December and March-April should be excluded from the assessment.

7.16 I do however consider that any future assessment of ammonia toxicity during the life of the scheme should allow for temperature and pH adjustment of ammoniacal-nitrogen data, and suggest that the conditions specify it.

7.17 Notwithstanding the above points, I have reviewed the predicted median and 95th percentile ammoniacal nitrogen concentrations downstream of the discharge in Table 3 of Mr Hamill's evidence. Overall, I do not believe these new predictions materially change the conclusions drawn in the WQJWS, i.e. that:

(a) Chronic toxic effects are expected on a range of aquatic life under the current situation and Stage 1A;

(b) There will be a gradual reduction of the toxicity risk due to ammonia as Stages progress from 1A to 2B;

(c) Effects during Stage 2B will negligible;

(d) During Stages 1B and 2A, there will be a low risk of toxicity to most species, but with possible chronic effects on the most sensitive species, such as freshwater clams and mussels;

(e) It is possible, based on Mr Hamill's new modelling and accepting the corrections to pH 7.9 and temperature 14°C, that freshwater clams may be adequately protected from Stage 2A onwards, but the

thresholds recommended by Mr Hickey[6] for the protection of freshwater mussels remains largely exceeded in stages 1B and 2A.

7.18 Overall, having reviewed Ms Hammond's and Mr Hamill's evidence, I am comfortable with the assessment undertaken and the conclusions reached in the WQJWS and do not see any reasons to change them. In summary, this means I am of the view the application has more than minor effects until the end of Stage 2A, as follows:

(a) During Stage 1A effects on visual clarity, toxic effects from ammonia, effects on periphyton and macroinvertebrates are expected to be significant;

(b) During Stage 1B, effects on visual clarity, toxic effects from ammonia on sensitive species, periphyton and macroinvertebrate communities are expected to be more than minor. Effects on macroinvertebrates could be significant for limited periods of time;

(c) During Stage 2A, effects visual clarity, toxic effects from ammonia on the most sensitive species and macroinvertebrate communities are expected to be more than minor, albeit lesser than during Stage 1B. Effects on macroinvertebrates and visual clarity will be intermittent in nature. Ammonia toxic effects are only likely on the most sensitive species such as freshwater mussels, but will occur for the duration of the stage (on the basis that the effect relates to reduced recruitment/survival, and extends beyond periods of discharge to the stream).

8. PROPOSED CONSENT CONDITIONS

8.1 I have reviewed the consent conditions proposed by the Applicant (version dated 3 April 2019, provided as Part C of Mr Sven Exeter's evidence), with

[6] NIWA memo dated 28 September 2018

a particular focus on Schedule 1 (general conditions) and 2 (discharge to Donald Creek).

8.2 I provide a detailed commentary and recommendation about specific conditions in the following paragraphs; however, I am concerned that the package of conditions overall does not accurately reflect the proposal described in the Application.

8.3 The potential effects of Stages 1A, 1B and 2A were assessed on the basis of specific assumptions about the timing, rate and quality of discharges to Donald Creek; however, the consent conditions as proposed do not fully reflect these assumptions. The conditions as proposed could, in theory, allow discharge regimes to the stream that could be very different from those presented in the AEE, and those used as the basis for the assessment of potential effects presented in the WQJWS, my evidence, Ms Hammond's and Mr Hamill's. For instance:

(a) There is no clear limit on the timing and frequency of discharges to Donald Creek during Stages 1A, 1B and 2A[7]. This is different from the information provided in the Application, such as Table 13 of the Application[8], which provides the expected frequency of discharges to the stream at different times of the year. In my opinion, the timing and frequency of discharges to the stream is a major driver of the risk of effects and should not be ignored in the conditions;

(b) Condition 2, Schedule 2 provides the discharge regime for Stage 2 B. It requires no discharge during "summer months" (which are not defined in the condition). This is different from the information I have relied on, which predicts zero discharge to the stream except in July and August (Table 15, Appendix 8 to the Application). The Application

[7] The only references appear to be in Schedule 1, Condition 7, which provides narrative objectives for the Management and Monitoring Plans.
[8] Tables 15 to 24 in the Mott MacDonald water quality assessment report (Appendix 8 to the AEE) provide more detail

also predicts zero discharge to the stream below median flow (Tables 23- 24 Appendix 8 to the Application), but this is not carried through in the consent conditions;

(c) The only limitation to the rate of discharges to Donald Creek in the proposed conditions during stages 1A, 1B and 2A is based on annual average and 90th %ile daily rate of discharge (m^3/d) (Schedule 2, condition 1). There is no consideration of the rate of discharge relative to stream flow conditions (and thus dilution) at the time of discharge;

(d) The proposed conditions relative to effluent quality need to be clarified, but may not fully reflect the existing discharge quality or the assumptions made in the modelling used to assess the potential effects of the discharge (as detailed further below).

8.4 If I was asked to assess the potential effects of the proposal on the basis of the proposed conditions alone, my conclusions would be materially different, particularly during Stages 1B and 2A. For example, the discharge of 7,700 m^3/day (Condition 1) of effluent at 12 mg/m^3 of total ammoniacal-nitrogen (Condition 3) to Donald Creek when the stream is running at median flow would result in a total ammoniacal nitrogen concentration in the stream after full mixing of 4.4 g/m^3, which exceeds the NPSFM National Bottom line of 2.20 g/m^3 and could result in acute toxic effects on a range of species, and. This is by no means a worst-case scenario, as both the discharge volume and concentration can exceed these assumptions, and stream flow will be less than median flow 50% of the time.

8.5 As I already raised in my original evidence (paragraphs 8.5(a)), the potential effects of future stages were assessed on the basis of effluent quantity and quality, land discharge and storage modelling, which in turn was based on a number of assumptions. Should these assumptions not be correct (e.g. less I/I reduction, less discharge to land) and/or the discharge regime (i.e.

timing, frequency, rate, quality) to the stream be different to that described in the AEE, then the future effects of the discharge would be different from those described in my evidence.

8.6 In his evidence Mr Irvine raises concerns relative to a number of technical aspects of the scheme[9], which might result in the rate and/or frequency of discharge to Donald Creek increasing compared to what is described in the AEE.

8.7 As also indicated by Mr Irvine, the Applicant has indicated that "adaptive management" can be utilised during detailed design and operation to ensure that the proposed wastewater irrigation system can manage sufficient wastewater loads to limit discharges to surface water to no more that the frequency utilised in the application. However:

(a) Mr Irvine has identified a risk that there will be insufficient conservatism in the proposal to enable "adaptive management" within the proposed system to be utilised to prevent an increase in discharge to Donald Creek (beyond what is proposed in the application); and

(b) I cannot find, in the proposed conditions a requirement to compare the actual discharge regime during the operation of the Scheme to what was described in the AEE. It thus seems difficult to see how the future discharge regime will be adaptively managed in a way that discharges to Donald Creek at each stage are not more than what is described in the Application;

(c) To be clear, I am not opposing the concept of adaptive management. In my experience, some degree of adaptive management is necessary in complex, yet-to-be implemented, schemes such as this one;

[9] E.g. the level of reduction in wastewater volumes that can be achieved; the seasonal distribution of irrigation; the soil drainage rates; the flux rates utilised in the Ground Water Model; the calculated ground water mounding area and its impact on the modelled irrigation distribution.

however, the "targets" the adaptive management will seek to achieve need to be clearly defined. In my opinion, the proposed consent conditions as they stand fail to do that.

8.8 To address these concerns, I recommend that:

(a) The consent conditions should include direct references to the discharge regime described in the AEE, such as, for example Table 13 of the AEE and/or some of tables 15-24 in the Mott MacDonald water quality assessment report (Appendix 8 to the Application) should be included in the conditions as "management targets" for each stage. Whilst it is important to acknowledge these tables are based on modelling and reflect predicted statistics averaged over a number of years, it is also important to bear in mind that the assessment of effects relied heavily on this modelling;

(b) The consent conditions should require that the actual discharge regime during the operation of the scheme be regularly compared with the above "management targets". Any significant discrepancy resulting in more/more often than predicted discharge to the stream should be investigated and remedied. For example, Table 20 (Appendix 8 to the Application) predicts less than 4 days of discharge to the stream per month in January to March during Stage 1B and in December to March inclusive during Stage 2A. The causes of discharges during say, more than 5 days per month during any of these months should, in my opinion, be investigated and addressed by adaptive management;

(c) Consent conditions for Stage 2B should preclude discharges to the stream outside July and August, and discharges at stream flows below median flow. The reasons for any discharge at flows below 2 × median flow should be investigated and addressed to avoid a re-occurrence;

(d) Discharge rates should be managed to:

(i) minimise as much as practicable discharges with dilution rates of less than 1:10 during Stage 1A and 1B; and

(ii) preclude dilution rates of at less than 1:10 at all times and minimise dilution rates of less than 1:15 during stages 2A and 2B.

8.9 Proposed conditions 3 and 4 (Schedule 2) define treated wastewater standards for wastewater discharged to Donald Creek, based on a number of exceedances over any 12 consecutive monthly test results. However, Schedule 6 requires monitoring of treated wastewater at the plant outlet monthly, and the discharge may not be directed to the stream on that one day per month. It is unclear whether the treated wastewater standards apply to the last 12 monthly monitoring results or the last 12 samples collected at times when the discharge was actually going to the stream. If the latter, there is a risk it will take several years before 12 representative samples can be collected (especially at later stages of the Scheme), unless discharge sampling is specifically targeted to the times when the discharge to the stream is operating. This needs to be clarified.

8.10 Once the above point is clarified, the numerical thresholds will need to be reviewed to ensure they are consistent with those described in the Application[10]. For example, the current 90th percentile of ammoniacal nitrogen concentration is 8.7 g/m^3 (based on Mr Couper's evidence, Table 3); however, condition 3 sets a maximum concentration of 12 g/m^3 (not to be exceeded more than 3 out of 12 samples).

8.11 Condition 7 (Schedule 2) sets in-stream "triggers".

[10] For example, Table 14 of the Mott MacDonald water quality assessment report (Appendix 8 to the AEE)

(a) Condition 7b sets a trigger for periphyton cover, using the PeriWCC index, while pNRP Objective 25 (and the NPSFM) uses periphyton biomass (measured as mg chlorophyll a/m^2) as the key measure of periphyton abundance. I recommend that any in-stream "trigger" for periphyton be aligned with Objective 25;

(b) Condition 7a defines "trigger values" for ammonia toxicity. These include the NPSFM National Bottom Line. The Application predicts that the National Bottom Line will be after implementation of Stage 1A and 1B[11]. On that basis I recommend that the NPSFM National Bottom Line should be set as a standard, not a trigger value, to provide a minimum degree of protection from Stage 1B.

(c) As agreed in the WQJWS, it is sensible to apply the 'Default' level of protection to Donald Creek, i.e. the ANZECC 95% protection level, which also corresponds to NPSFM Band B.

    (i) Mr Hamill predicts that the median concentration threshold for this level of protection (a median concentration not exceeding 0.24 g/m^3 at pH 8, 20°C) will easily be met from Stage 1 (his Table 3). I thus suggest that this threshold should be applied as a trigger from Stage 1B;

    (ii) Mr Hamill also predicts that the 95th percentile concentration threshold for this level of protection (a 95th percentile concentration not exceeding 0.40 g/m^3 at pH 8, 20°C) will be achieved from Stage 2A once allowing for pH and temperature correction. I thus suggest that this threshold should be applied as a trigger from Stage 2A;

[11] Mott MacDonald water quality assessment report (Appendix 8 to the AEE), p66 and Table 35

(iii) Lastly, I suggest that the 95th percentile concentration threshold for the long-term protection of freshwater mussels (kakahi) should be used as "trigger" for Stage 2B onwards, as both Mr Hamill and Ms Hammond predict it will easily be met;

(iv) As indicated in my paragraph 7.16, I recommend that in-stream total ammoniacal-nitrogen data be corrected for pH and temperature for comparison with the above standards/trigger values;

(v) As a result, Table 2 in Condition 7 should, in my opinion, be modified to read:

	Total ammonia <u>standard</u> (shall not be exceeded)	**Total ammoniacal nitrogen <u>trigger values</u> (trigger condition 8 investigation)**		
Stage applicable	from completion of stage 1B	from completion of stage 1B	From completion of Stage 2A	From completion of Stage 2 B
Median	1.3	0.24	0.24	
Annual 95th percentile		0.92	0.40	0.24
Annual maximum	2.2	2.2	2.2	2.2
Note all standards and trigger values given in g/m^3 and are based on pH 8.0 and Temp 20°C. Compliance with the standards and trigger values shall be undertaken after pH and temperature adjustment.				

8.12 Condition 8 (Schedule 2) specifically refers to QMCI and MCI, whilst triggers refer to a range of parameters, including ammonia and periphyton. In my opinion this condition should be re-drafted to include all parameters.

8.13 Condition 13 (Schedule 2) requires the undertaking of a summer and winter ecological survey of Donald Creek. However, from Stage 1B onwards,

summer and winter have been identified as being the lowest risk periods (summer because the discharge will be mostly out of the stream, and winter because of flow variability). In my opinion, it would be preferable to focus on the spring and autumn periods, given they have been identified as the most environmentally risky and uncertain periods.

8.14 Condition 13 should also be amended to include clear protocols for the periphyton assessment and the processing of macroinvertebrate samples.

Date: 10 May 2019

Olivier MN Ausseil