19 December 2018

Environment Southland
Private Bag 90116
Invercargill 9348

Attn: Lauren Maciaszek

Dear Lauren,

RE: Request for Further Information under Section 92(1) of the Resource Management Act 1991 - Application APP-20181765 TJ & JA Driscoll

This letter is our response to your request for further information dated 19 November 2018.

1. Phosphorus losses

a) Quantification of P losses

The consent application included Overseer modelling of the current and proposed farming systems. The Overseer modelling showed total P loss to increase between the current and proposed scenarios by a total of 16 Kg P/year or 5.7%. On a per hectare basis, estimated P losses between the current and proposed scenarios shows no change.

Our application identified that Overseer lacks the same validation in relation to P losses that it contains for N losses because it is not spatially explicit, and many mitigation measures used on farm are not accounted for in the Overseer model. You have asked us to try and quantify how much P reduction may result from these un-accounted for mitigations.

Mo Topham, who completed the Overseer nutrient budgets for this application has quantified how much P loss is likely to be mitigated through the continued and improved mitigation of runoff losses from laneways on the property by way of kickboards on bridges and crossings, improving lane cambers, increasing buffer distances and improving the cut outs that direct runoff into paddocks (see attached memo).

Mo Topham has quantified there to be a 19kg P reduction in total P losses under the proposal with the implementation of P mitigation measures not rewarded in Overseer. Mo also mentions additional mitigations including a change to P fertilizer type and a slight reduction on Olsen P. At this stage, the applicants will not be implementing these mitigations initially under this proposal, however they will be kept as future mitigations to consider.

b) Description of the effectiveness of the mitigation measures and GMP's

The quantification in Mo's memo focused just on the mitigation of laneway runoff on the farm because this was simple to quantify using available research. The table below lists the other GMPs that are not so easy to quantify that the applicant adopts to manage P losses from the property and quantifies how effective these GMPs are likely to be. The table also notes whether or not the benefits of these GMPs are rewarded in Overseer[1]. The

[1] *Hurunui-Waiau Nutrient Budgeting Case Studies*, report prepared by Rebecca Hyde & James Hoban (December 2014). http://www.landcare.org.nz/files/file/1445/Hurunui-Waiau%20Nutrient%20Budgeting%20Case%20Studies.pdf

effectiveness of each GMP has been estimated based on a recent AgResearch publication[2] as well as professional judgement. The timeframe for implementation has also been noted.

Good Management Practice	Rewarded in Overseer?	Effectiveness (range)	Implementation Timeframe
Fencing and planting of streams	Yes	52 – 61 %	Done on current platform. Not required on new block
Appropriate vegetated buffers from water ways	Not assessed	38 – 58 %	Done on current platform. Proposed increase in buffer area on the lane to the south of the dairy shed prior to the exercise of the consent. Not required on new block
Avoid working CSAs and their margins (leave vegetated areas around CSAs)	No	38 – 58%	Done on current platform and will be implemented in an ongoing manner going forward on the new block also
Providing sufficient effluent storage to enable deferred application	Partially	12 – 17 %	Done
Minimising run-off from tracks, lanes and stream crossings using cut-offs and shaping	No	Up to 30%	Done on current platform and will be implemented in an ongoing manner going forward on the new block also. Overall improvement to barge boards and cutoffs proposed prior to the exercise of the consent.
Using low rate effluent application	Yes	25 -32 %	Done
Spread fertiliser evenly and precisely	Yes	Unknown	Done and will be implemented going forward on the new block from first exercise of consent

[2] McDowell, R., Wilcock, B., and Hamilton, D., 2013. Assessment of Strategies to Mitigate the Impact or Loss of Contaminants from Agricultural Land to Fresh Waters. Report prepared for MfE. Publication RE500/2013/066

Good Management Practice	Rewarded in Overseer?	Effectiveness (range)	Implementation Timeframe
Avoiding applying fertiliser directly to streams	No	Unknown	Done. Not applicable to new block
Targeting optimum Olsen P	Yes	Unknown	Done and will be implemented going forward on new block. Currently targeting an Olsen P of 32.
Restricted grazing	Unlikely	42 – 70 %	Done on current platform and will be implemented going forward on the new block
Shifting break fences strategically	No	86 %[3]	Done on current block and will be implemented going forward on new block.

The information in the above table shows that the applicant will be adopting GMPs that are designed to mitigate P losses from the property and that many of these mitigations are not rewarded in the Overseer model and therefore P losses under the proposal are likely to be less than reported by Overseer and over and above the 19kg P mitigation described by Mo Topham.

The applicant is happy to accept a condition on the land use consent specifically related to any of these mitigations to provide council certainty of their implementation. These mitigations are also in the FEMP which will be implemented and reviewed annually.

c) An explanation of how certain we can be that P losses will decrease as described in the application

The quantification memo by Mo Topham clearly describes how laneway management such as installing kickboards and directing runoff to pasture is estimated to reduce phosphorus losses from laneways by up to 38%. The further improvement in these mitigation measures in the proposal is estimated to result in a further 11% reduction in phosphorus losses. This body of work was based on extensive independent research and has a high level of certainty.

Mo Topham's memo has only focused on one form of P mitigation measures out of all of the measures listed in the above table. If a similar quantification was able to be done for the proposed improvement and expansion of all of the measures in the table across to the new east block, then there is a high level of certainty that actual P losses would reduce further under the proposal.

Also, the applicant's farm is likely to be one of only three farms in the immediate surface water and groundwater catchment which will be governed by a land use consent for the entire farming operation if granted (under Rule 20 of the PSWLP). By operating under one of these land use consents, the applicant will always be required to

[3] Environment Southland Critical Source Areas Factsheet. Es.govt.nz. Retrieved: 12 March 2018.

operate within nutrient limits, report annually on their predicted contaminant losses and provide evidence of the implementation of all GMP's. This level of restriction and scrutiny can only have positive effects on water quality in the catchment compared to the alternative where their operation is not restricted in any way other than by a discharge permit and a FEMP. By electing to go through the process of obtaining a land use consent for their farm, the applicant is accepting these restrictions and as a result the P losses are likely to decrease in the long term compared to a long term scenario based on the current consenting regime. A reduction in P losses in the catchment in the long term as a result of nutrient limits and restrictions on the applicant should have positive effects on water quality.

d) Confirmation of the GMP's already in place and which will be implemented going forward

Please see the table above which describes the implementation timeframes of the P loss mitigations. All other GMP's in the FEMP are already being implemented on the current platform, but will be further refined and improved. All measures in the FEMP will then be extended to the new block once the consents are granted.

2. Phosphorous losses AEE and Policy 16

The quantification we provided above concluded that the modelled 16kg P total increase between the current and proposed scenarios will not actually occur in reality with the implementation of mitigation measures on farm to mitigate P losses. The quantification focused on P loss mitigation from laneways which indicated at least a 19kg P further mitigation of P losses outside of modelled losses from Overseer. The implementation of the other GMP's would further mitigate predicted P losses.

As a result, we will not be providing an AEE on the modelled increase of 16kg P because our assertion is that it will not occur in reality. However, we accept that the proposal results in a quantity of P lost to waterways as a result of the presence of this farming activity in its entirety within this catchment. Phosphorus adsorbs to sediment and losses occur via pathways above ground which are visible to the eye. Sediment shares the same contaminant pathway as P, and so GMPs that address P will address sediment, and vice versa. The predominant transport mechanism for *E. Coli* is via attachment to particulate matter, and so GMPs that address P and sediment will also help to reduce *E. Coli transfer*. *E. Coli* can also be transported via deep drainage, although *E. coli* are normally quickly attenuated in the subsurface because of a wide range of attenuation processes including filtration, dispersion, die-off, predation, etc. Nonetheless, GMPs that address N losses via deep drainage will also help to address *E. Coli* losses to groundwater.

Effects of phosphorus, sediment and microbial losses to receiving water bodies include:

- Excess phosphorus in our waterways can increase the growth rate of microscopic algae which can cloud the water bodies making it difficult for the vegetation to receive sufficient sunlight and maintain adequate oxygen levels for supporting life. As a consequence, the natural waterborne vegetation may die, leading to a severe reduction in the available habitat area and food for other aquatic life. The death and decomposition of algae during the normal lifecycle will reduce the dissolved oxygen levels in the water. The lowering of oxygen levels in water bodies is called "hypoxia," which will negatively impact overall biological activity in the ecosystem and survival rates of aquatic life often decrease as a result of hypoxia. [4]

[4] Rao Mylavarapu, Impact of Phosphorus on Water Quality, IFAS extension, University of Florida, https://edis.ifas.ufl.edu/pdffiles/SS/SS49000.pdf accessed 7 December 2018

- Bacteria (e.g. E.coli) – faecal bacteria including E.coli are an indication of potentially disease-causing organisms that can make humans and animals sick

- Sediment (e.g. mud and silt) – accumulates on the bottom of our rivers, lakes and estuaries. It is a problem because it can make the water murky, block fish gills, smother the habitat that macroinvertebrates and fish live in and promote slime algae growth. Sediment in streams can be generated from heavy rainfall on vulnerable soils, disturbance of the riverbed or bank by heavy machinery or stock or through direct discharges

It is difficult to quantify exactly what "effect" on water quality in the receiving environment is from the applicant's farming activity in isolation because water quality effects relate to a variety of different factors and will also be influenced by all activities in the catchment. The application described the existing groundwater and surface water receiving environments in detail. The application concluded that, as with many lowland water bodies in Southland, there is a level of water quality degradation as a result of the land use activities within the wider catchment. We have used a combination of the Overseer modelling and quantification of proposed mitigations which sit outside of Overseer to conclude that nutrient losses from the proposal will be less than the current nutrient losses. Less nutrients being lost from the subject farming operation is likely to result in less nutrients in the receiving water bodies. Less nutrient load in the receiving water bodies is likely to have a positive effect on water quality in general. A positive effect on water quality results in less likelihood of the effects described above which result from excess nutrients in water bodies. Cumulative adverse effects on water quality should therefore be avoided because the proposed activity will entirely replace the current consented activity, resulting in a reduction in nutrient losses to the receiving environment.

The farm contains tributaries of the Oreti River within the landholding which discharge to the Oreti 3.6km downstream. No tributaries of the Makarewa or Tussock Creek are present within the landholding but the eastern portion of the property is mapped to drain to these catchments. An improvement in water quality in the Oreti River tributaries which run through the landholding will occur as a consequence of implementation of the following:

- Improved laneway management by better constructing the bargeboards on the bridges, improving the camber and increasing the size of the buffer on the laneway south of the cowshed.
- The removal of intensive grazing of fodder crop on the dairy platform which results in improved soil structure and a reduction in the amount of exposed soil as well as the accumulation of excess nutrients during high drainage periods.
- Improved management of CSAs through implementation of the FEMP; and
- Extension of GMPs as outlined in the FEMP to the east block

These changes will result in the following:

- Less run-off of sediment and associated contaminants to water;
- Reduction in N and P losses below the root zone and to water (which serve as a proxy to indicate a reduction in *E. Coli* and sediment losses);

All waterways have been fenced from stock and there is extensive riparian planting already in place. Overall, the proposal will result in an improvement in water quality in the Oreti tributaries compared to current water quality.

We are confident that there is a significant body of New Zealand and overseas publications that support our conclusions. However, we acknowledge that given the scale of the farm it would be hugely challenging to actually demonstrate water quality improvements unless many years of intensive near continuous water quality

monitoring of these waterways was undertaken in the vicinity of the property using continuous measurement methods prior to the proposal occurring so that the baseline is fully understood for comparative purposes.

Policy 16 of the PSWLP requires the minimization of adverse effects of farming activities by generally not granting applications for new farming where adverse effects cannot be avoided or mitigated. The AEE in the application and written above concludes that adverse effects, including cumulative effects, on water quality will be avoided. The proposed land use change will result in the establishment of a farm system which in its entirety, operating with a full suite of mitigation measures, results in a reduction to the nutrient load lost to the receiving water bodies and therefore the avoidance and mitigation of adverse effects on water quality – both directly and cumulatively. The assessment against Policy 16 in the application stands.

3. Clarification as to total cow numbers on the property

The applicants will have 732 cows on farm as of 1 June going into winter as this is the number of cows they intend the calve. Dairy farmers will always calve more cows than they intend to peak milk because the winter period and the calving period often results in a number of deaths and losses. Farmers often do a small cull of cows after calving if they have been injured, sick or are not good producers. The number of cows peak milked will still be 700.

4. Fodder crop and grass/baleage

In the current scenario, the entire herd is sent to an off-site grazier for the winter. However, because you need to transition cows for the winter period, 2.8ha of fodder crop is sown on the dairy farm in combination with a paddock of grass/baleage for transitioning purposes. Transitioning is an important process to enable the cows to change their diet either going to or coming from the off-site glaziers and requires both fodder beet and baleage to be introduced to the diet. The current nutrient budgets has modelled the transition process by putting an average of 83 cows per month grazing a combination of these crops and grass/baleage. The application explained that this doesn't mean that 83 cows are grazing this crop for the winter period, the model used a monthly average to model a portion of the herd grazing these areas for a short period at the start of June and for a short period at the end of July to allow for transitioning.

Therefore, the applicants' statement that they stopped wintering on crop four years ago is absolutely correct and is fully accounted for in the current nutrient budgets appended to the application. In the past (i.e more than four years ago) the applicant used fodder crop for some wintering. The 2.8ha of fodder beet in the current budgets is not for wintering, it is for transitioning. Approximately 4 years ago the applicant added in grass/baleage transitioning also which is fully accounted for on the current nutrient budgets.

The proposed nutrient budgets sees the complete removal of fodder beet from the farm system, even for transitioning. A grass/baleage system proved to be effective on this property and the applicant has now decided to utilize grass/baleage to winter a portion of the herd on the platform in the future.

5. Updated nutrient losses

The current nutrient budget accurately described how the applicant uses fodder beet crop for transitioning purposes and not for wintering which was ceased on farm approx. four years ago. The applicant adopted grass/baleage grazing in combination with this transition crop. The current nutrient budgets therefore do not need to be amended.

I trust that the information set out above satisfies the request for further information, however if you have any further queries, please do not hesitate to contact me at any time.

Kindest Regards

Tanya Copeland

Senior Planner, Landpro