BEFORE THE COMISSIONERS APPOINTED BY

SOUTHLAND REGIONAL COUNCIL

In the matter of	The Resource Management Act (RMA, 1991)
And	
In the matter of	Resource Consent Application for a land use permit, a water permit and a discharge permit
By	T.J. and J.A. Driscoll on behalf of Driscoll Trust

STATEMENT OF EVIDENCE

ABIGAIL LOVETT

11th January, 2020

INTRODUCTION

1. My name is Abigail Lovett.

2. I have been engaged by Environment Southland to provide technical evidence regarding potential impacts on the receiving environment as a result of the activities proposed by the Resource Consent Application by Driscoll Trust.

3. I have obtained a Bachelor of Science Honours Degree (BSc Hons) awarded in First Class and a Master of Science Degree (MSc) completed with Distinction from the University of Otago, New Zealand.

4. I have more than 10 years' experience working in research and consulting of hydrogeology and surface water hydrology in Southland and throughout New Zealand. Following completion of my degree I was employed at the Institute of Geological and Nuclear Science (GNS Science) as a groundwater scientist (2012 – 2018). I subsequently worked in consulting and became the Director of Earth & Environmental Science Limited in 2018, where I am currently the Lead Scientist and Project Manager.

5. During this time, I have gained considerable experience through researching and applying methods for characterisation of water resources, including water quality and water quantity. These investigations have predominantly been motivated by the need to improve our understanding of the hydrological environment to allow for better resource management including:
    a. field data collection (e.g., geological logging during groundwater drilling; water sampling; aquifer testing; borehole testing);
    b. measurement and understanding of (rainfall and irrigation) recharge processes;
    c. determining aquifer hydraulic properties;
    d. assessment of groundwater resources for water allocation;
    e. contributing to water resources policy and planning (e.g., aquifer boundaries);
    f. determining potential impacts of land use on water quality (e.g., monitoring and assessment of waste water treatment disposal fields; intensification of agriculture; hydrocarbon exploration);
    g. identification of groundwater security for drinking water supplies;
    h. integration of Matauranga Maori and western science;
    i. incorporation of community values for effective catchment scale modelling; and
    j. research into improved methods for measurement of groundwater – surface water interaction.

6. I have been a member of the New Zealand Hydrological Society (NZHS) since 2010 and served as a member of the NZHS Executive from 2015 - 2019. I have been an Associate member of the New Zealand Institute of Primary Industry Management (NIZIPIM) since 2018.

7. I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note (updated 1 December, 2014) and agree to comply with the code. The issues I have addressed within this statement of evidence are within my area of expertise. I have not knowingly omitted to consider any information or facts that would alter or detract from the opinions expressed in this statement.

SCOPE OF EVIDENCE

8. A resource consent application was submitted by T.J. and J.A. Driscoll on behalf of Driscoll Trust. The application sought consents to allow for the expansion and continued operation of a dairy farm located at 266 O'Shannessy Road, *c.* 5 km south of Winton. Dairy support is provided for wintering of cows off-farm.

9. The application proposes an increase in area of the dairy platform (inclusion of 'East Block') and associated consents for land use for dairy farming (including an increase in cows from 599 to 680), effluent discharge, and groundwater abstraction.

10. I have developed this evidence based on a technical report that I prepared for the Driscoll consent application (Lovett, 2019).
    Lovett A., 2019. Review of Resource Consent Application by Driscoll Trust. Earth & Environmental Science Report 2019/06, prepared for Environment Southland Regional Council. 27p.

11. This evidence is specifically related to the impacts of the proposed activities on the receiving environment, with a focus on effects to surface water and groundwater. The following primary topics will be covered in regards to the activities proposed in the consent application:
    a. Impacts of an increase in number of cows;
    b. Impacts of increased effluent discharge;
    c. Impacts of increased groundwater abstraction; and
    d. Impacts of land use intensification (conversion).

KEY FINDINGS

12. Surface water bodies that drain the local catchment include Oreti River, Makarewa River, and Tussock Creek – all of which are located within the Oreti Freshwater Management Unit. The original application focussed on the Oreti River catchment and failed to suitable address impacts on the Tussock Creek and Makarewa River catchments.

13. Overall, surface water quality information showed that land use in the catchment has had an impact on the water quality of the Tussock Creek, Makarewa River, and Oreti River including increased nutrient, bacterial, and sediment contamination. The most likely source of bacterial contamination and increased nutrients is land use change and intensification in the catchment.

14. Furthermore, the downgradient receiving water of New River Estuary is exhibiting significant issues associated with excessive macroalgal growth and likely represents the largest impact of this type to have occurred in this type of estuary in New Zealand. Studies indicate that unless nutrient inputs to the estuary are reduced significantly, it is expected that there will be a continuation of these difficult to reverse adverse impacts within the estuary. Although it is difficult to indicate the exact proportion of nutrients contributed by the applicant's property, it could be considered that any contribution to the Oreti River catchment is likely to have an impact on the New River Estuary.

15. The dairy platform is predominantly located within the Lower Oreti Groundwater Management Zone with the eastern area of the farm within the Makarewa Groundwater Management Zone. Groundwater levels showed strong seasonal signals due to the influence of rainfall, land surface recharge, and abstraction. There was no evidence of a long-term decline in groundwater level over time.

16. Since these aquifers are predominantly recharged via rainfall, they are particularly vulnerable to the influence of land surface processes on water quality, particularly where bypass flow can occur (e.g., soil cracks). Results of limited groundwater quality monitoring datasets indicated that the Makarewa and Lower Oreti groundwater systems have been impacted from land use processes, including elevated nutrient concentrations and increased bacterial contamination.

17. Land use has the potential to affect the Lochiel School groundwater supply due the close proximity and inferred groundwater flow direction. A brief assessment of this drinking water supply was undertaken in the application and no assessment of additional downstream sites has been undertaken, including Alliance Makarewa and Alliance Lorneville supply sites.

18. The description of the receiving environment provided in the application is relatively basic and relies on limited data sources, which have been supplemented by additional information in this report. Overall, the data presented in the application clearly indicates that surface water, groundwater, and estuarine environments have been impacted by land use in the wider Oreti Catchment, in particular the New River Estuary.

19. Soil types on the property include Pukemutu and Edendale. Soil moisture datasets indicate that drainage is likely to occur during the period May – October, with differences in weather promoting earlier or later onset of land surface recharge. Soil moisture is a controlling factor in the timing and rate of effluent irrigation, since application of effluent can lead to leaching of nutrient and bacteria to groundwater and discharge of contaminants (including sediment) to surface water. A high level of effluent management is required to limit the adverse effects on surface water and groundwater. The proposed application of (an average of) 67 kg/N/ha/yr is approximately 44% of the recommended maximum areal rate of 150 kg/N/ha/yr. Regardless, some adverse effects of effluent application, including bacterial and sediment contamination of surface water is likely to occur due to shallow drainage and overland flow processes.

20. Overseer modelling showed a decrease in nutrient loss under the proposed consent activities (10,507 kg/N/yr; 212 kg/P/yr), when compared to the current activities (11,513 kg/N/yr; 230 kg/P/yr). This is equivalent to a 9% reduction in nitrogen loss and an 8% reduction in phosphorus loss. Primary drivers for the decrease in nitrogen and phosphorus loading included: a reduction in winter crop area and fertilizer use; an increase in effluent discharge area resulting in a reduction of effluent application depth; and increased use of barley and baleage grass wintering. It is suggested that this modelled reduction in nutrient loss could likely occur on-farm, however it is continually overstated in the application as being "…*a significant reduction*" when more appropriate terminology should have been used in the application (e.g., possible, or likely).

21. Even under the reduced nutrient loadings, the proposed activities have the potential to adversely affect surface water, groundwater, and estuarine environments. Any instance of

mitigation measures proposed in the Farm Environment Plan or Overseer are not followed will result in an increased risk of nutrient, sediment, and/or bacterial loss to the receiving environment.

22. Modelling of nutrient budgets indicates a likely reduction in nitrogen and phosphorus loss when the current scenario is compared to the proposed scenario. The potential impacts on bacterial contamination and sediment are more uncertain, since these contaminants cannot be modelled in Overseer and since the potential for Pukemutu Soils to undergo bypass (preferential) flow is not well considered. Furthermore, it must be highlighted that the reduction in nutrient loss relies heavily on the mitigation measures proposed in the Farm Environment Plan and Overseer being implemented and operating successfully.

23. Finally, the following aspects of the application are not adequately described (or are unclear) in the application, and should be addressed by the applicant:
    a. Whether increased abstraction from bore E46/1067 is proposed, and if so, why an (e.g., desktop) assessment of the effects for the increased abstraction has not been undertaken; and
    b. A description of how soil moisture management is actually implemented or how relevant soil moisture data is used to determine current soil conditions to ensure effects of FDE application are minimised, has not been provided.

Signed by: 

Name: Abigail Lovett

Date: 11/01/2020