BEFORE THE PALMERSTON NORTH CITY COUNCIL, (PNCC) THE MANAWATŪ DISTRICT COUNCIL (MDC) AND THE TARARUA DISTRICT COUNCIL (TDC)

IN THE MATTER OF the Resource Management Act 1991 ('the RMA')

AND

IN THE MATTER OF NOTICES OF REQUIREMENT by the New Zealand Transport Agency ('the Agency') under section 168 of the RMA for the construction, operation, maintenance and improvement of approximately 11.5 km of new State Highway between Ashhurst and Woodville to replace the closed section of state Highway 3 through the Manawatū Gorge and associated works, known as the Te Ahu a Turanga; ManawatūTararua Highway Project ('The Highway')

ADDENDUM TO STATEMENT OF EVIDENCE OF **CORY MATTHEW**

EFFECTS ON THE AGRESEARCH BALLANTRAE LONG TERM HILL COUNTRY PERFORMANCE TRIAL ('The Trial')

INTRODUCTION:

1. My full name is Cory Matthew.

2. I submitted a statement of expert evidence (SEE) dated 15th March 2019

3. I have the qualifications and experience indicated in my SEE.

4. I reconfirm that I have read the code of conduct for expert witnesses and confirm that this Addendum has been prepared in compliance with the code.

5. In this Addendum, abbreviations used are as in my SEE.

6. The purpose of this Addendum to my SEE is to clarify comments in my original SEE that have come under discussion since it was written, notably in Addendum to the evidence statement Morton (dated 25th March 2019), on behalf of NZTA, which I have read and reflected on, and also implicit in an email invitation received on Friday afternoon 29th March from Mr Greg Lee, NZTA Principal planner proposing a workshop on either 1st or 2nd April 2019 to discuss those matters further.

7. Two key points are (i) the degree to which the impact of The Highway on The Trial will be mitigated by a smaller designation corridor or final construction footprint, and (ii) the significance of factors not discussed in detail, such as the expected impact on The Trial over time, of vehicle emissions from The Highway.

Clarification of my original evidence

8. *Area of the trial:* A 1983 scientific paper from the trial (Lambert et al., 1983) refers to “10 self-contained farmlets” on 99 ha. As I understand, The Trial has been cut down for long-term retention. We now have 4 self-contained farmlets on 31.14 ha according to Horne (Paragraph 20). In my opinion, the present configuration is already minimal for operational integrity, and *any* further reduction is potentially problematic.

9. *Percentage area and number of sites lost:* From a statistical perspective, the concept of the data “signal to noise” ratio comes into play (my SEE paragraph 20, citing Hugh Gauch at Cornell University). A smaller trial inevitably captures a reduced data signal; meanwhile the statistical error when calculating significance is divided by the square root of the number of sampling sites. Thus with fewer sampling sites compared to the present 72 on the 4 treatments, the error term would be increased, as it would then be divided by a smaller number. In my experience of running trials it is common to have a data trend that is likely a treatment effect, but statistically non-significant in formal analysis, and the measurement effort

is then wasted. How many sites or what area is sufficient to attain statistical significance will depend on many factors including data properties, but in my opinion it is definitely not good for the future usefulness of the site for there to be a further reduction in area or sampling sites (regardless of whether we are talking about a designation corridor or final construction footprint).

10. *Reason for my opinion that the designation corridor is the definitive footprint:* In my SEE paragraph 23a I argue it is the designation corridor that is important rather than the construction footprint. My reasoning here is that grazing history is critical to soil status, and it would be expected that once land is purchased by NZTA, grazing would be interrupted or altered for several years. On the HF-HF farmlet loss of grazing would result in an extra 6 – 10 tonnes per year of plant drymatter being returned to the soil which would greatly change soil properties, to the point the land could not later be credibly returned to the trial.

11. *Relative lack of recent measurements:* Since the trial was established, scientists and the industry have evolved effective metabolic energy budgeting methodologies to infer pasture production from data on numbers, weight and performance of animals. If such data are available (AgResearch has indicated anecdotally to that effect), missing pasture productivity data can be calculated retrospectively, to about +/- 5% accuracy, similar to the precision of direct measurement.

12. *The accumulation of treatment effects over time:* At this site, it is the 45-year treatment history that is valuable and offers unique opportunity for formulation of new research issues for study in a defined treatment structure. All experts agreed on 22nd March continuation of the trial would not be viable if the then publicised designation corridor was lost to the trial. In that case, any subsequent use of the site would seem to involve isolating a part of the area with a particular history to set up a new trial, starting from scratch. I struggle to see how such an approach would produce data of interest to industry or for publication (CM, page 9, Joint Witness Statement dated 22nd March 2019). Future value of the site for scientific enquiry depends, in my opinion, on retention of the functional comparison of the present 2x2 combination of fertiliser treatments.

13. *Effects of vehicle emissions:* Addendum to the evidence of Morton (Paragraph 40) implies that post construction monitoring will control this issue and that the issue is outside the scope of the expert witnesses. To the contrary, *if* there is an issue, post construction monitoring will only identify that after the damage is done. Moreover, it is not quite correct to say the experts don't have experience; rather the topic is difficult to research and little formal research has been carried out. It can be definitively confirmed, however, that the effect of vehicle emissions would

not be zero. In my SEE I cited a recent study (Nicolaeva et al. 2019) based on a highway near Moscow with 125,000 vehicle movements per day. Here, I extract a sample of data from Table 1 of that study:

Measurement	Distance from highway		
	10 m	50 m	150 m
Soil pH	7.5	7.2	6.8
Soil electrical conductivity (microsieverts per cm)	99	91	72
Soil % carbon	3.65	3.52	3.50

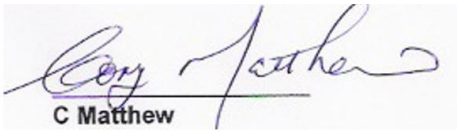
The point is that with such soil changes likely on a band of 50 m from the road, the scientific presumption that data reflect only the effects of treatments imposed on the trial, becomes suspect, and such doubts could affect ability to publish and would also impact on decisions about continuation of the trial.

References:

Lambert M.G. et al. 1983. Influence of fertiliser and grazing management on North Island moist hill country. *New Zealand Journal of Agricultural Research 26:* 95-108.

Nicolaeva, O. et al. 2019. Ecotoxicological effects of traffic-related pollutants in roadside soils of Moscow. Ecotoxicology and Environmental Safety 172, 538 – 546.

SIGNED:



Cory Matthew

2nd April 2019