

BEFORE THE INDEPENDENT HEARINGS PANEL

UNDER

the Resource Management Act 1991

AND

IN THE MATTER OF

the submissions of B & A Stokes on
the Waimakariri Proposed District
Plan (#214) and Variation 1 (#29)

**SUPPLEMENTARY EVIDENCE OF
PAUL FARRELLY
ON BEHALF OF B AND A STOKES
(Greenhouse Gas Emissions)**

2 August 2024

GREENWOOD ROCHE
LAWYERS
CHRISTCHURCH
Solicitor: R Murdoch
(rmurdoch@greenwoodroche.com)

Kettlewell House
Level 3, 680 Colombo Street
P O Box 139
Christchurch
Phone: 03 353 0574

1 EXECUTIVE SUMMARY

- 1.1 My evidence responds to the greenhouse gas (**GHG**) emission matters raised in the report prepared for Hearing Stream 12E of the Proposed Waimakariri District Plan (**PDP**) under section 42A of the Resource Management Act 1991 (**RMA**) (**Section 42A Report**).
- 1.2 In particular, it responds to the report by BECA commissioned by Waimakariri District Council (**BECA Report**) which addresses the Stokes' proposed rezoning of 81 Gressons and 1375 Main North Road (the **Site**) to Medium Density Residential and corresponding Outline Development Plan (**ODP**) (the **Proposal**).

2 QUALIFICATIONS AND EXPERTISE

- 2.1 My full name is Paul Michael Farrelly. I work for Lumen, an engineering consultancy, as a Principal Consultant in their dedicated energy and carbon team.
- 2.2 I have the qualifications and experience set out in my primary evidence of 4 March 2024.

3 CODE OF CONDUCT

- 3.1 While this is not an Environment Court proceeding, I confirm that I have read the Code of Conduct for Expert Witnesses set out in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and will continue to comply with it while giving oral evidence. Except where I state that I am relying on the evidence of another person, this written 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 expressed in this evidence.

4 SECTION 42A REPORT – RESPONSE

- 4.1 Policy 1 of the National Policy Statement on Urban Development 2020 (**NPS-UD**) describes the attributes of "well-functioning urban environments", one of which is that, as a minimum, they "support reductions in greenhouse gas emissions".

- 4.2 In my primary evidence, I concluded that that outcome was met through the Proposal on the basis that:
- (a) Both the Site and the Proposal had specific characteristics which would reduce GHGs comparative to other development proposals in Greater Christchurch. These include the Site's proximity to commercial hubs which reduce the likelihood for extended private vehicle travel, the provision of cycleways to encourage active transport uses, and the Site's proximity to existing public transport services.
 - (b) The Proposal would replace the existing dairy farm operation on the Site which will also support a reduction in GHGs.
- 4.3 I have read the Section 42A Report and the BECA Report.
- 4.4 The BECA Report appears to be premised on the basis that the NPS-UD Policy 1(e) requires the proponent of a proposal to:
- (a) undertake a calculation of the GHGs of that proposal against a baseline scenario; and
 - (b) demonstrate that the GHGs of that proposal will be less than that baseline scenario.
- 4.5 BECA has gone to some lengths to try to calculate the Proposal against a number of baseline scenarios, and has concluded that the Proposal will not result in a reduction of GHGs compared to those scenarios. On that basis, the Section 42A Report appears to conclude that the Proposal will fall short of the emissions attribute of a "well-functioning urban environment" described in Policy 1(e) of the NPS-UD.
- 4.6 In my opinion, BECA has incorrectly interpreted the requirements of the NPS-UD. Put simply, nowhere does the NPS-UD require such an assessment to be made. To explain that position, I first consider the broader GHG related context behind the NPS-UD.
- 4.7 My understanding is that Policy 1(e) was included in response to the Climate Change Response (Zero Carbon) Amendment Act 2019 to

support achievement of New Zealand's GHG emissions targets through the NPS-UD.

4.8 New Zealand has two key GHG emissions targets as set out by the Climate Change Response (Zero Carbon) Amendment Act 2019:¹

- (a) reduce net emissions of all GHGs (except biogenic methane) to zero by 2050; and
- (b) reduce emissions of biogenic methane to 24–47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030.

4.9 As mentioned, NPS-UD Policy 1 requires that planning decisions contribute to well-functioning urban environments, which are urban environments that, as a minimum:

- (a) have or enable a variety of homes that:
 - (i) meet the needs, in terms of type, price, and location, of different households.
 - (ii) enable Māori to express their cultural traditions and norms; and
- (b) have or enable a variety of sites that are suitable for different business sectors in terms of location and site size; and
- (c) have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport; and
- (d) support, and limit as much as possible adverse impacts on, the competitive operation of land and development markets; and
- (e) support reductions in greenhouse gas emissions; and
- (f) are resilient to the likely current and future effects of climate change.

¹ Climate Change Response (Zero Carbon) Amendment Act 2019, section 5Q.

- 4.10 Through that definition, the NPS-UD envisages that housing can be provided for within urban environments through a variety of housing types and prices by way of intensification of existing urban areas, as well as greenfield development, in a variety of locations.
- 4.11 In my opinion, Policy 1(e) does not require a comparison of GHG emissions between the Proposal and alternative locations, or between the Proposal and the existing land use (as BECA has undertaken in its report). Further, I do not consider that the direction in the NPS-UD requires a particular proposal to show reductions in GHGs *per se*. Policy 1(e) requires proposals to contribute to supporting reductions within the wider urban environment by enabling and encouraging people to take positive action in reducing their own GHG emissions.
- 4.12 This can be done through ensuring new development is located close to key activity centres (**KAC**) and public transport corridors and is of a form and design which practically takes steps to support people (i.e. future residents of the proposed rezoning/development) to make reductions in their overall GHG footprint. The Proposal does this in the following ways:
- (a) Its close proximity to the Ravenswood KAC, with much of the Site located within 1km of the New World supermarket.
 - (b) Its close proximity to other community facilities including recreation spaces in Pegasus and primary schools in both Pegasus and Woodend.
 - (c) The provision of an extensive pedestrian / cycle network, with strong connectivity to Ravenswood, which is in turn well connected to Rangiora via the dedicated cycleway.
 - (d) Provision for a community centre within the Site, that is proposed to contain community facilities such as a medical centre or preschool.
 - (e) Extensive landscaping (including wetlands) throughout the Site.
 - (f) Designing the roading network within the Proposal to accommodate future public transport.

- 4.13 Furthermore, the reduction in GHGs is supported by the removal of dairy cows from the Site. Such a change also supports achievement of New Zealand's methane emissions reduction target.
- 4.14 In that context I note that the Climate Change Commission's (**Commission**) demonstration path (**Demonstration Path**) (the core scenario for how New Zealand will achieve its GHG targets) anticipates that, although there are potential technologies (such as methane inhibiting vaccines and low emissions breeding) that could also potentially reduce methane emissions, a key strategy must be a reduction in the national herd size. It assumes that stocking rates of dairy cows nationally would need to reduce 23% by 2050 compared to 2021.²
- 4.15 Therefore, I am of the view that reducing the amount of land available for dairy farming, as anticipated by the Proposal, contributes to supporting a reduction in GHG emissions (specifically biogenic methane), in accordance with the Climate Change Response (Zero Carbon) Amendment Act 2019.
- 4.16 In conclusion, the NPS-UD does not require a reduction in absolute emissions to be achieved from a change in land use. Indeed, if it did, then any sort of housing intensification would not meet the test due to the inherent increase in residents, associated travel emissions, and associated embodied and operational emissions, on the parcel of land. I therefore disagree with the approach that BECA has taken with its Report, and I remain of the opinion that the Proposal meets the requirements of Policy 1(e) of the NPS-UD. I nevertheless consider it is still worth addressing some of the other issues with the BECA report.

Specific issues with the BECA Report

- 4.17 The Section 42A Report author observes (based on the BECA Report) that it appears that new development sites (in greenfield areas) have higher emissions than the existing towns of Rangiora and Kaiapoi. While this conclusion seems reasonable at first glance, it is crucial to

² Climate Change Commission, *Updated demonstration path and current policy reference scenarios*, November 2023, ERP2-supporting-spreadsheet-Updated-demonstration-path-and-CPR-2022.xls. at row 607.

recognize that BECA's calculations rely primarily on the Christchurch Transport Model.

- 4.18 I understand that that model bases future travel patterns on historical data and the travel patterns of existing residents of an area, which potentially skews the results. In my opinion, this analysis does not, and cannot, accurately model how a cohort of individuals that opt to live in a new location will actually travel in future. As such, any comparisons using such a model need to be treated with a degree of caution.
- 4.19 For instance, it is difficult to rationalise how the calculated, and predicted emissions for an equivalent cohort of residents in the Pegasus/Woodend area would be double those of Rangiora residents when both locations are approximately the same distance from Christchurch, and Ravenswood will eventually be a KAC catering to much of the day-to-day needs of local residents and will offer employment opportunities.
- 4.20 The Section 42A Report (at [875]) also states that all proposed greenfield developments will have higher emissions than the farms they replace.
- 4.21 In this context, it is important to note that the total emissions arising from a development will largely be a result of its population. For instance, the total emissions of 100 households would be lower than the emissions of the dairy farm, whereas the emissions of say 1,500 households would be higher (until the New Zealand vehicle fleet becomes mostly electric – this is discussed further below).
- 4.22 If the NPS-UD required that the emissions of developments be lower than the existing land use, then this would support low density development only, which is clearly not the intention of NPS-UD.
- 4.23 The emissions factor figure for passenger vehicles that BECA has used is 0.252kg CO₂-e/km:
- (a) I note that I used this figure in my primary statement of evidence to simply put into context the yearly emissions from

the existing dairy farm.³ My aim was to highlight that the dairy farm's emissions are significant and to offer a comparison to better illustrate their scale.

- (b) However, this figure (0.252kg CO₂-e/km) is the emissions per km of an average private petrol vehicle in New Zealand, based on the makeup of the 2022 national vehicle fleet. It is not the emissions for an average vehicle in the fleet as it ignores diesel, electric and hybrid vehicles.
- (c) The average emissions factor for passenger vehicle travel is projected by the Commission and in Waka Kotahi's Vehicle Emissions Prediction Model (Version 6.3) (**VEPM**) to reduce significantly over time as newer more energy efficient vehicles enter the fleet (such as hybrids), and as there are a greater proportion of electric vehicles in the fleet.
- (d) BECA does acknowledge this, by reference to a 20% reduction in emissions factors between 2018 and 2031, based on the VEPM.
- (e) However, the earliest establishment date for dwellings at the Site is estimated to be 2028, and based on discussions with the submitters the full development is not expected to be completed until 2040.
- (f) Therefore, the emissions factor used to calculate the anticipated vehicle emissions should use the anticipated vehicle emissions factor in 2040, not 2022.
- (g) I have reviewed the VEPM, and it forecasts that by 2040 the average emissions per vehicle will reduce to 124g CO₂-e/km, or 0.124kg CO₂-e (compared to the 0.252kg CO₂-e that BECA has used).
- (h) The VEPM predicts that by 2050 most (75%) of light vehicle travel will be in electric vehicles (**EVs**), however in my opinion,

³ Primary evidence of Paul Farrelly on behalf of B & A Stokes, 4 March 2024 (**Farrelly EIC**) at [8.17].

that VEPM significantly underestimates the rate at which EV travel will increase as a proportion of total light vehicle travel.

- (i) The VEPM assumes that electric vehicles will make up 32% of light vehicle kilometres travelled (**VKT**) in 2040. By comparison, the Demonstration Path assumes that 75% of light VKT travel in New Zealand will be in EVs in 2040.⁴
- (j) The Demonstration Path is the main scenario which underpins the Commission's recommended emissions budgets for New Zealand and therefore I consider it to be the most appropriate predictor of the future makeup of the vehicle fleet.
- (k) Using the VEPM, but updating for the Commission's EV predictions, we can then calculate the future average emissions per kilometre in the light vehicle fleet across different time horizons. To do this, I have assumed that the percentage of travel in EVs is as per the Commission's model, and all other light VKT, is in "average" petrol vehicles. This is a conservative approach as it ignores the effect of more efficient hybrid vehicles.

4.24 The results are shown in **Table 1**.

⁴ Climate Change Commission, *Updated demonstration path and current policy reference scenarios* (ERP2-supporting-spreadsheet-Updated-demonstration-path-and-CPR-2022, Excel, 2022).

Year	VEPM: Average Vehicle emissions (gCO₂- e/km)	VEPM: % of light fleet VKT in EVs	% of light vehicle kms – Climate Change Commission demonstration path	Inferred average vehicle emissions (using VEPM) (gCO₂-e/km)
BECA*	252.0			
2024	196.0	1.1%	3.6%	191.8
2028	187.4	2.7%	8%	184.1
2035	158.1	13.7%	50%	100.3
2040	124.0	32.0%	75%	50.3
2045	81.2	57.1%	90%	20.1
2050	50.5	75%	98%	4.0

* Average emissions of a petrol vehicle in 2022, used in BECA Report.

Table 1: Future average emissions of NZ's light vehicle fleet

4.25 The next issue lies with the BECA Report's modelling of the number of vehicle movements per day:

- (a) Based on Mr Rossiter's primary evidence, the typical traffic generation rate of suburban residential activity is about 8 vehicles per day per household, but is dependent upon location in relation to education, employment and retail centres, and public transport services.⁵
- (b) In Mr Rossiter's opinion, this rate provides an upper limit to what could be generated by the Site. As such, an emissions calculation based on this rate is conservative.
- (c) According to BECA, the average trip length for a household on the Site would be 12km. This is derived from the Christchurch Transportation Model (V21a). As mentioned, any comparative calculations of emissions using this tool should be treated with caution.

⁵ Primary evidence of Chris Rossiter on behalf of B & A Stokes, 4 March 2024 (**Rossiter EIC**), at section 11.

- (d) However, in the absence of other data or tools, I accept that that model is likely currently the best predictor for travel distances in Canterbury.
- (e) I have used the daily trip rate (8), the number of days (300), and average trip rate (12km) to calculate the total kilometres per household on the Site. This equates to 28,800kms per annum per household.
- (f) Transportation emissions can then be calculated in the following way:
- (i) Emissions = #households * annual travel distance * emissions per km.
- (ii) So, for 2040, when the development is expected to be completed, the calculation for vehicle emissions is:
- 2040 Emissions = $1,500^6 * 28,800 * 50.3\text{g CO}_2\text{-e/km} = 2,173\text{t CO}_2\text{-e}$
- (iii) And in 2050, when almost all vehicle travel in New Zealand is expected to be in electric vehicles:
- 2050 Emissions = $1500 * 28,800 * 4.0\text{g CO}_2\text{-e/km} = 173\text{t CO}_2\text{-e}$
- (g) These values are significantly lower than the emissions calculated in the BECA Report (11,112 t CO₂-e).

4.26 Turning to the dairy farm, since my primary evidence was produced, the Ministry for the Environment (**MFE**) has released updated (and increased) emissions factors for dairy cattle.⁷ Further details of this are attached as **Appendix 1**.

4.27 Using these up to date figures, the annual emissions from the dairy farm can be calculated to be 1,535t CO₂-e (up from 1,428t CO₂-e in my evidence).

4.28 A comparison of this modelling to the modelling from the BECA Report is show in **Table 2**.

⁶ For the purposes of comparing against the BECA Report I have used 1,500 households. I understand that the proposal now seeks to enable 15 hh/ha, potentially resulting in 1,900 households. This increase would proportionally raise the overall emissions.

⁷ Ministry for the Environment, *Measuring emissions: A guide for organisations: 2024 detailed guide*, 31 May 2024 (pages 126-131).

Model	t CO2-e
BECA modelled transport emissions	11,112
Dairy farm emissions (revised)	1,535
2040 transport emissions	2,173
2050 transport emissions	173

Table 2: GHG Comparison to BECA model

4.29 Looking at a comparison of transportation emissions and dairy farm emissions over time:

- My modelling assumes that housing development commences in 2028, and concludes in 2040, with 125 houses (1500/12) built per annum.
- I assume that the dairy activity will cease once construction of the development commences in 2028.
- As the vehicle emissions factor reduces over time, peak transportation emissions are anticipated to occur in about 2038, and then decline after that time as the vehicle fleet moves closer to 100% electric.
- The results of my modelling are shown in Figure 1 below:

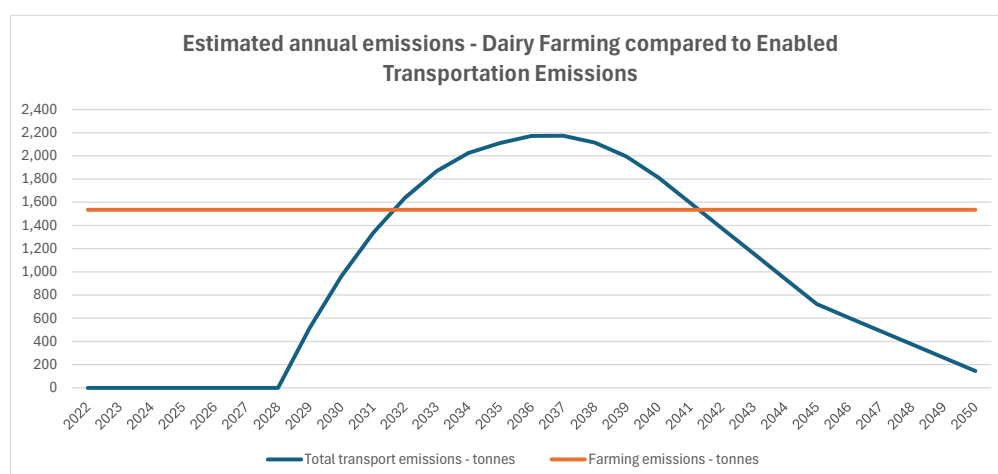


Figure 1 – estimated annual emissions

- (e) My modelling suggests that due to the development timeframe (2028-2040), and the expected improvements in the efficiency of the vehicle fleet during this timeframe, the emissions associated with the vehicle transport of residents may temporarily (between 2031-2042) exceed the levels of emissions that would occur if dairying were continued at the current levels of activity, however, in the long-term the travel emissions can be expected to be lower than those of the dairy farm alternative.
- (f) For all other periods, the transportation emissions are modelled to be lower than the anticipated dairy emissions.

4.30 As set out above, I do not consider the modelling above to be necessary to demonstrate that the Proposal contributes to supporting a reduction in GHG emissions. I am of the view that, irrespective of this modelling, the Proposal does contribute to supporting a reduction in GHG emissions.

Paul Farrelly

2 August 2024

**Appendix 1: Comparison of 2023 and 2024 MFE Emissions Factors
for Agriculture**

Factor	MFE 2023	MFE 2024	% Change
Enteric Fermentation – per dairy cow	2,423	2,628	8.4%
Manure Management – per dairy cow	254.5	266	4.5%
Agricultural Soils	377.2	414	9.8%