Before the Independent Hearings Panel
at Waimakariri District Council

under:	the Resource Management Act 1991
in the matter of:	Proposed private plan change RCP31 to the Operative Waimakariri District Plan
and:	**Rolleston Industrial Developments Limited** *Applicant*

Evidence of Paul Farrelly

Dated: 7 July 2023

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EVIDENCE OF PAUL FARRELLY

1 My full name is Paul Michael Farrelly.

2 I have a BE Civil Engineering (Hons) from the University of Canterbury. I started my career as a traffic and road safety engineer and have subsequently had over 25 years commercial experience working across a number of industries. Over the past 10 years I have worked in the energy and carbon field.

3 For the past four years I have worked for Lumen, an engineering consultancy, as a Principal Consultant in their dedicated energy and carbon team. In this capacity I have developed greenhouse gas (*GHG*) inventories for a significant number of organisations, in a broad range of sectors. This includes infrastructure companies, an airport, several electricity distribution businesses, manufacturers, consulting firms and retail businesses. Through this work, I am well versed in calculating GHG emissions. I have previously provided GHG evidence for several plan changes in the Selwyn District Council area.

4 I am familiar with the plan change application by Rolleston Industrial Developments Limited (*RIDL*) to rezone approximately 156 hectares of rural land in Ōhoka to residential (Residential 2, 4A) and business land (Business 4) (*PC31*).

CODE OF CONDUCT

5 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

6 My evidence addresses:

6.1 What GHG emissions are and the National Policy Statement on Urban Development 2020 *(NPS-UD)* framework for considering GHG emissions;

6.2 Overview of PC31 relevant to my evidence;

6.3 GHG emissions from the current land use of the PC31 site;

6.4 Anticipated GHG emissions from the development and land use enabled by PC31;

6.5 Responses to submissions; and

6.6 Response to Section 42A report.

EXECUTIVE SUMMARY

7 GHG emissions are currently occurring on the PC31 land, because of the livestock (dairy cows) that are grazed on the land and their associated emissions.

8 These emissions occur primarily from methane, which has a much greater (28 times) impact on global warming than carbon dioxide per ton of gas emitted.

9 The removal of livestock from the land would support a reduction in GHG emissions.

10 PC31 will result in new emissions from the construction and occupation of dwellings and commercial buildings, and from travel undertaken by residents.

11 Over a 90-year life cycle, energy usage is currently the most significant source of emissions that occurs in residential developments in New Zealand, followed by the embodied carbon of building materials.

12 The type of houses envisaged in PC31 are relatively low on an emissions per m^2 basis[1] compared to multi-storey apartments. This is because high embodied carbon materials (concrete and steel) are typically used to build multi-storey apartments, compared to stand alone houses (like those envisaged in PC31), that are primarily constructed of timber.

13 Lifetime energy usage emissions from stand-alone homes can be minimised through the specification of energy efficient homes, the elimination of natural gas/LPG in developments, and encouraging a high uptake of solar PV panels.

14 The potential for solar PV uptake is much greater on stand-alone single ownership homes - such as those envisaged in PC31 - compared to multi-storey apartments or medium density multi-level homes, or where a body corporate exists, due to the much greater ratio of usable roof area to floor area and a simplified ownership structure.

[1] https://iopscience.iop.org/article/10.1088/1755-1315/588/2/022064/pdf

15 The developer has specified a requirement that dwellings are Electric Vehicle (*EV*) charging ready, which will support the uptake of EVs within the plan change area, and support GHG emissions reductions.

16 A reduction in emissions would also be supported by the introduction of public transport to the plan change area, which **Mr Simon Milner** has assessed can be provided.

17 PC31 proposes a mixture of residential and commercial development, with excellent pedestrian and cycleway connectivity through the development. This is advantageous from a GHG perspective as some day-to-day trips of PC31 residents will be undertaken using active travel modes.

18 The development of commercial areas in PC31 may also reduce the travel emissions of the existing residents of the Ōhoka area somewhat, who currently need to travel outside the area to access shops and other facilities.

19 The site has also been identified as suitable for a school, and provision for this is allowed within the plan change request. Should such a school be developed in PC31, this would reduce emissions associated with travelling to school.

20 Based on the evidence of **Mr Chris Jones**, the typical buyer targeted in this development, is a buyer who wishes to purchase in a rural suburb, relatively close to a major metropolitan centre.

21 I consider it reasonable to assume that if a prospective buyer in is unable to find a suitable property in Ōhoka, they are likely to buy a similar property and are unlikely to choose a townhouse in Christchurch City. Given the relative value and availability of land, these buyers may need to buy further out from Christchurch.

22 That could potentially result in a worse outcome from a GHG perspective compared to PC31.

23 Accounting for the points above, I consider that the PC31 development 'supports a reduction in GHG emissions' (as per NPS-UD Policy 1(e)) due to the removal of dairying activity from the land, and I am satisfied that RIDL has undertaken practical steps to support a reduction in emissions arising from the development.

INTRODUCTION TO GREENHOUSE GASES

24 There are several gases that contribute to the problem of global warming, the most prevalent of these being carbon dioxide (CO_2), methane and nitrous oxide.

25 Each of these gases have differing abilities to trap extra heat in the atmosphere, and it is the trapping of this heat that leads to global warming.

26 When evaluating GHG emissions, it is useful to have a common measure to allow comparisons between gases. As CO_2 is by far the most prevalent of the GHGs, it is standard practice when measuring emissions to determine the level of each gas emitted, and then convert these emissions into their carbon dioxide equivalent, or CO_2-e.

27 The global warming potential (*GWP*) of a gas is a measure of its ability to trap extra heat in the atmosphere over time relative to CO_2. This is most often calculated over a 100-year period and is known as the 100-year GWP. The GWP of CO_2 is 1.

28 Methane is a short-lived GHG and has a GWP that is 28-36 times that of CO_2 over a 100-year time frame. Over a shorter year time frame its impact is much more significant, estimated at 84 times that of CO_2 over a 20-year period.

NATIONAL POLICY STATEMENT ON URBAN DEVELOPMENT 2020

29 The NPS-UD requires planning decisions to contribute to well-functioning urban environments, which are environments that "support reductions in greenhouse gas emissions" (Policy 1(e)).

30 When considering the GHG emissions of a proposed development or land change it is appropriate to consider the life-cycle emissions of the proposed development, and the net change in emissions compared to the emissions arising from the current land use.

31 It is notable that the NPS-UD does not specify a geographical boundary in which the effect of greenhouse gas emissions should be considered. Therefore, I consider that supporting reductions in GHG emissions should be considered at several different levels – local, regional, national, or global.

32 The ultimate purpose of reducing GHG emissions is to limit global warming. In the context of this purpose, it should not matter where or how emissions reductions are supported.

33 New Zealand has a growing population and a critical need to build more affordable housing.

34 There are many potential ways that this growing population can be accommodated. For instance, dwellings can be built in different locations, different types of housing can be constructed, and different construction materials can be used.

35 Due to the materials required to build new housing, and the energy used in the operation of houses, some emissions arising from new developments are unavoidable.

36 Therefore, it is important that decisions on where to build houses in New Zealand are made in respect of their overall impact on GHG emissions, compared to other potential locations.

37 In the context of GHG emissions arising from housing related developments, I believe that GHG assessments should be based primarily on how the development's net life cycle emissions (that is an evaluation of emissions before and after the development) compares to alternative comparable development options within New Zealand, as opposed to whether the development, in and of itself reduces GHG emissions. That is because the issue is not whether housing should be provided, but whether it should be provided via PC31.

OVERVIEW OF ŌHOKA VILLAGE RESIDENTIAL DEVELOPMENT

38 The PC31 site is located at Ōhoka, an inland residential settlement to the north-west of Kaiapoi. Specifically, the PC31 site is bordered by Mill Road, Bradleys Road, and Whites Road.

39 The PC31 request is to rezone approximately 156 hectares of land currently zoned Rural to Residential 2, Residential 4A, and Business 4 zoning.

40 PC31 envisages the development of approximately 850 to 892 dwellings, a school and retirement village, as well as two commercial areas providing local convenience goods and services for residents.

41 The Business-zoned area at Whites Road frontage is intended to form an extension of the existing Ōhoka Village with the provision of a range of small-scale commercial activities and local services to meet the daily needs of locals and visitors including a General Store, Bakery, Café, Hairdresser, Pharmacy etc. There is also provision for work studio and upper-level office spaces which would cater for local services such as accountants, lawyers, medical and professional consulting businesses.

EMISSIONS FROM EXISTING LAND USE

42 When considering a proposed development's impact on GHG emissions, it is first important to establish the level of emissions arising from the existing use of the land.

43 I visited the area of PC31 on 11 June 2023 and I have also read through the Geotechnical assessment, Preliminary Site Investigation

and the Landscape and Visual Assessment reports that were attached to the PC31 application.

44 The land is largely flat, and mostly open with some areas of partial tree coverage, mostly hedging. I observed a reasonably large number of dairy cows across a few locations across the PC31 area.

45 Information provided by the operators of the Sherraine Holsteins farm, currently occupying 152.5ha of the approximate 156ha of the PC31 area, notes that the land currently supports a milking platform and support block for a herd of approximately 270 milking cows, 120 calves, and 3 breeding bulls.

46 GHG emissions from farming operations include methane emissions from the livestock that is grazed on the land, manure and urine produced by these animals and the use of fertiliser on the farm.

47 As outlined above, methane is a short-lived GHG and has a GWP that is 28-36 times that of CO_2 over a 100-year time frame and 84 times over a 20-year period. Its potency and impact on global warming were reflected at the recent COP26 climate change summit, where consequently a global pledge has been signed by 105 countries, including New Zealand, to reduce methane emissions 30% by 2030 compared to 2020 levels.

48 Notably, agriculture is by far the largest contributor to GHG emissions in the Canterbury region[2], accounting for approximately 62.6% of the region's emissions in 2019, based on Statistics NZ data (7,296,000t/ 11,641,000).

49 GHG emissions from the current farming operations include the following:

49.1 Enteric fermentation – the process by which ruminant animals produce methane by digesting feed;

49.2 Manure management – the storage and treatment of manure produces emissions (including the emissions from manure which is applied to land);

49.3 Agricultural soils – soils emit nitrous oxide due to the addition of nitrogen to soils through manure, dung and urine;

49.4 Fertiliser use – applying nitrogen (urea-sourced or synthetic) fertiliser onto land produces nitrous oxide and carbon dioxide

[2]https://www.stats.govt.nz/information-releases/greenhouse-gas-emissions-by-region-industry-and-household-year-ended-2019.

emissions. Applying lime and dolomite fertilisers results in carbon dioxide emissions; and

49.5 The use of energy in operating the farm – fossil fuels used in vehicles and electricity to power cow sheds/irrigators/pumps.

50 Emissions for a farming operation can be calculated using guidance provided by the Ministry for the Environment (*MFE*)[3]. In this guide, MFE provide annual emissions on a per animal basis.

51 The relevant emissions factors, per dairy cow, per annum are as follows, updated to reflect the latest emissions factors published by MFE in August 2022:

51.1 Enteric fermentation – 2264 kg CO_2-e;

51.2 Manure management – 238 kg CO_2-e; and

51.3 Agricultural soils – 468 kg CO2-e.

52 The relevant emissions factors published by MFE in August 2022 for non-dairy cattle, per annum per animal, are as follows:

52.1 Enteric fermentation – 1540 kg CO2-e;

52.2 Manure management – 21.4 kg CO2-e; and

52.3 Agricultural soils – 267 kg CO2-e.

53 The MFE factors above are based on a GWP value of 25 for methane, however it is recommended by the International Panel on Climate Change that a higher GWP, of at least 28, should be used when calculating methane emissions.

54 Using the MFE factors, the emissions of the existing land use can be determined based on the number of animals grazed. This can be calculated as (2264 + 238 + 468) = 2,970kg CO_2-e per dairy cow and (1540 + 21 + 267) = 1,828 kg CO_2-e per non-dairy cattle.

55 As outlined above, another significant emitter of GHG emissions from farm operations is the use of nitrogen fertiliser.

56 GHG emissions occur when the nitrogen in fertiliser is converted to nitrous oxide through natural biological soil processes.

[3] Measuring Emissions: A Guide for Organisations – 2022 detailed guide.

57 According to an Overseer report for the Sherraine Holsteins farm on the PC31 site, 36 tons of fertiliser per year[4] are applied to the land. This translates to approximately 195 tons CO_2-e per year.

58 Using MFE factors, we can calculate that the total emissions resulting from activity on the farm per annum are 1,359 tons of CO_2e, based on:

58.1 Total emissions from 270 milking cows, 120 calves and 3 breeding bulls of approximately 1,164 tons CO_2-e per year; and

58.2 Approximately 195 tons CO_2-e per year from fertiliser application.

59 This total excludes any emissions from fossil fuels used on the land and electricity use, as these figures are not available.

60 This total also excludes fossil fuels, electricity use and vehicle fuel associated with processing the milk collected from the farm, which I understand to be processed by Fonterra at their Darfield site – which is largely still powered by coal.

61 To put this into perspective, 1,359 tons CO2-e is equivalent to the following:

61.1 5.1 million vehicle kilometres travelled in a typical New Zealand vehicle (using the MFE's default private car emission factor (2020) per km of 0.265); and

61.2 The average annual electricity usage emissions of approximately 1,324[5] Canterbury households.

EMISSIONS FROM PROPOSED LAND USE

62 Like any new residential development, GHG emissions will occur across three different stages:

62.1 Emissions associated with the infrastructure required to support the development;

62.2 Emissions associated with construction and occupation of the dwellings and commercial buildings (primarily emissions arising from energy use); and

[4] Total applied fertiliser weight described in the Overseer report for Sherraine Holsteins Ltd – Sherriff P & R, year ending 2020

[5] The average residential home in Canterbury uses 8,550kWh per annum – per Electricity In New Zealand, 2018, The Electricity Authority. Emissions per kWh are 0.12kg CO2-e/kWh (latest MFE factors – August 2022)

62.3 Emissions from travel related activities of residents who live within the blocks.

Infrastructure emissions

63 I have reviewed the Geotechnical Report prepared by Tetra Tech Coffey which was attached to the PC31 application. This concluded that the PC31 site is largely flat, can be generally categorised as T1-like and is suitable for residential development from a geotechnical perspective.

64 The flat nature of the PC31 site will limit the extent of earthworks required and therefore the amount of fossil fuels that will be used in preparing the site for development.

65 The bulk of materials required in the infrastructure development stage (that have GHG emissions associated) are anticipated to be roading related (concrete/asphalt) and piping.

66 The level of infrastructure related materials required for a sub-division is largely a function of the hectares to be developed, as opposed to the number of dwellings.

67 Therefore, from an emissions intensity perspective in a greenfield development (that is, the emissions per resident), there is a benefit of increasing the density of housing in a greenfield development, which the proposed rezoning request supports.

68 In terms of materials for infrastructure, there is currently limited scope to avoid the use of GHG producing construction materials, however lower emissions materials are being developed all the time, and it is likely that by the time the development commences that lower emissions materials could be specified by RIDL.

Building lifecycle emissions

69 The second major component of GHG emissions is the emissions associated with construction and operation/occupation of the buildings (dwellings and commercial buildings).

70 A major contributing factor is emissions "embodied" in materials that are used in the buildings:

70.1 Embodied carbon relates primarily to the energy used to create building materials. Examples of materials with high embodied carbon are concrete and steel, compared to timber which has comparatively low embodied emissions.

70.2 There are two main ways of reducing embodied carbon in a dwelling:

(a) build dwellings using lower-carbon materials; and

(b) reduce the size of a dwelling.

71 A recent (2020) study undertaken by Massey University and BRANZ[6] assessed the expected life cycle emissions for three different types of residential dwellings: detached housing, medium-density housing, and an apartment.

72 A lifecycle analysis considers the emissions expected to be emitted across the various life stages of the development – this includes construction, operation, and end of life treatment.

73 The study considers that a New Zealand home is expected to last for 90 years and, therefore, a lifecycle analysis should consider emissions across this timeframe.

74 Key conclusions from the study were that the product stage (embodied carbon) is responsible for 16% of the life cycle emissions, with operational energy use responsible for 59%.

75 Embodied carbon was more significant for apartments, due to the greater use of high emissions materials such as concrete and steel in construction.

76 On a per m^2 basis, across a 90-year period, the lifetime emissions are highest for multi-storey apartments (21 kg CO_2-e/m^2/yr) compared to lifetime emissions for detached housing and medium density housing (13 kg CO_2-e/m^2/yr).

77 As multi-storey apartments are unlikely to be built in the proposed rezoning area, I consider that the embodied emissions resulting from the type of dwellings envisaged on the sites to be relatively efficient from a GHG perspective.

78 Furthermore, it is important to recognise that the emissions factor for electricity used in this study relates to a New Zealand average, whereas the emissions for electricity usage in the South Island are almost always lower than electricity in the North Island, due to the different mix of generation in the two islands. Most of the electricity used in the South Island comes from low emissions sources (hydro and wind), whereas electricity used in the North Island is generated from a mix of sources including geothermal, natural gas and coal. As such, the electricity used in the North Island has higher emissions.

79 Taking this into consideration, what this means is that embodied carbon is a much higher relative contributor to lifetime emissions for

[6] Application of Absolute Sustainability Assessment to New Zealand Residential Dwellings - S J McLaren *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* 588 022064

properties developed in the South Island compared to the North Island.

80 Therefore, to minimise the lifetime emissions associated with housing developed in the South Island we should be looking, as much as possible, to build houses using materials that have low embodied carbon such as standalone houses, medium density housing (townhouses) or apartments that are built primarily using timber.

81 When it comes to emissions from operational energy use, the main factors that influence this are:

81.1 how energy efficient a dwelling is;

81.2 the type of energy that is used in the dwelling;

81.3 the size of the dwelling; and

81.4 the use of on-site renewables.

82 With recent building code changes[7], new homes are more energy efficient than traditional New Zealand houses, due to better building materials and higher levels of insulation.

83 Energy-related emissions in the PC31 site can be further minimised by encouraging the uptake of solar PV panels and ensuring that reticulated natural gas/LPG is not provided as part of the development.

84 The PC31 site is well suited for solar PV due to its flat nature and limited obstructions (i.e. no hills) north of the site.

85 Furthermore, as apartments are unlikely to be built within the PC31 site, most houses are expected to be detached or semi-detached, and I would expect there to be a relatively high uptake of solar.

86 Taking these factors into account, I expect that dwellings built in the PC31 site would be relatively energy efficient compared to other developments and consequently would have relatively low emissions per resident.

Emissions from transportation

87 PC31 will result in new emissions from travel undertaken by residents.

[7] https://www.mbie.govt.nz/about/news/new-building-code-requirements-bring-biggest-energy-efficiency-change-in-over-a-decade/

88 Emissions from transportation related to PC31 are a function of the mode of transport (vehicle, bus, bicycle), distance travelled, and frequency of travel.

89 It is extremely difficult to accurately model or predict the level of travel related emissions that may occur from residents of any proposed development, because it is impossible to know who the residents are, and what their interests and travel requirements are. We can only make general observations as opposed to exact emissions calculations for transportation.

90 Given the lifecycle of a residential development (90 years), it is important to consider how travel patterns may change as we look forward to the future. The way we travel in 2050, and 2075 will be very different to how we travel today.

91 Therefore, it is important to consider trends that are already emerging (and expected in future), such as an increase in working from home (*WFH*), the potential for car-pooling, a move to EVs, the emergence of on-demand public transport, and increases in micromobility (e-scooters and e-bikes).

92 WFH has become more prevalent in recent years and I expect that the frequency of commuting-related travel (per person) between Ōhoka and Christchurch will reduce in future:

92.1 The experience of Covid-19 has shown that a significant proportion of workers are able to perform their duties from a home office. Many large employers now offer employees significant autonomy and flexibility when it comes to where and when they choose to complete their work duties.

92.2 The incentive to WFH is greater for employees who live further from their place of employment, due to the time and cost savings.

92.3 WFH will likely be even more attractive to those who live in a new, well-built, warm home.

92.4 It is therefore likely that residents of PC31 (who work in a Christchurch office, or in other Waimakariri District towns) will be strong adopters of WFH.

92.5 There is emerging evidence[8] from around the world that WFH has become an established practice in much of the Western World, with recent statistics from the US suggesting that the

[8] https://www.weforum.org/agenda/2022/07/work-from-home-employers-workers-work-life

number of days employees are spending WFH is increasing (from 1.58 days/week in Jan 2021 to 2.37 in June 2022).

92.6 Additionally, people in the state of Victoria[9], Australia were found to be more likely to live in 'peri-urban' (commuter belt, semi-rural) areas if they had the option to WFH.

93 I note that a communal office space has been identified in the concept plan (Design Report) for the commercial area within PC31. I would expect such a facility would be popular with commuters who reside in the PC31 area, and potentially their employers.

94 A trend I have observed recently is a number of large businesses and government agencies that are measuring (and targeting reductions from) emissions associated with employee commuting.

95 New Zealand Government agencies (via the Carbon Neutral Government programme, and most New Zealand listed companies (via the Financial Section (Climate-Related Disclosures and Other Matters) Amendment Act 2021[10]) are required, by law, to report on their emissions annually.

96 Employee commuting is considered as a Scope 3 (or Indirect) emissions source for organisations.

97 Per the requirements of these emissions reporting regimes, applicable organisations are required to report on (and reduce) all significant emissions, including Scope 3 emissions (which often includes employee commuting).

98 Therefore, there is an incentive for large employers to support their employees to reduce their commuting-related emissions.

99 As such, I expect that large employers who have multiple staff based in the PC31 area would be supportive of their workers WFH, or in a communal office space in PC31.

100 For similar reasons, I would also expect to see an increase of car-pooling in future, with large employers likely to facilitate car-pooling solutions for commuters.

[9] Infrastructure Victoria. (2021). The post-pandemic commute: the effects of more working from home in Victoria.

[10] https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/mandatory-climate-related-financial-disclosures/

Electric Vehicles

101 The New Zealand government committed (in its May 2022 Emissions Reduction Plan) to a target of 30% of EVs in the light vehicle fleet by 2035.

102 Since this time, the rate of uptake of EVs in New Zealand has been rapid[11] with the introduction of the Clean Car discount and the availability of more EV models. Additionally, a substantial increase in the price of fossil fuels has resulted in more and more New Zealanders looking to switch to electric.

103 Over the most recent four quarters for which data is available (April 2022 – March 2023), registrations of EVs have averaged 12%[12] of all light vehicles. Additionally, plug in hybrid and hybrid vehicle numbers have also increased.

104 The following chart (**Figure 1**) illustrates how the number of low-emissions vehicles in New Zealand has increased in recent years.

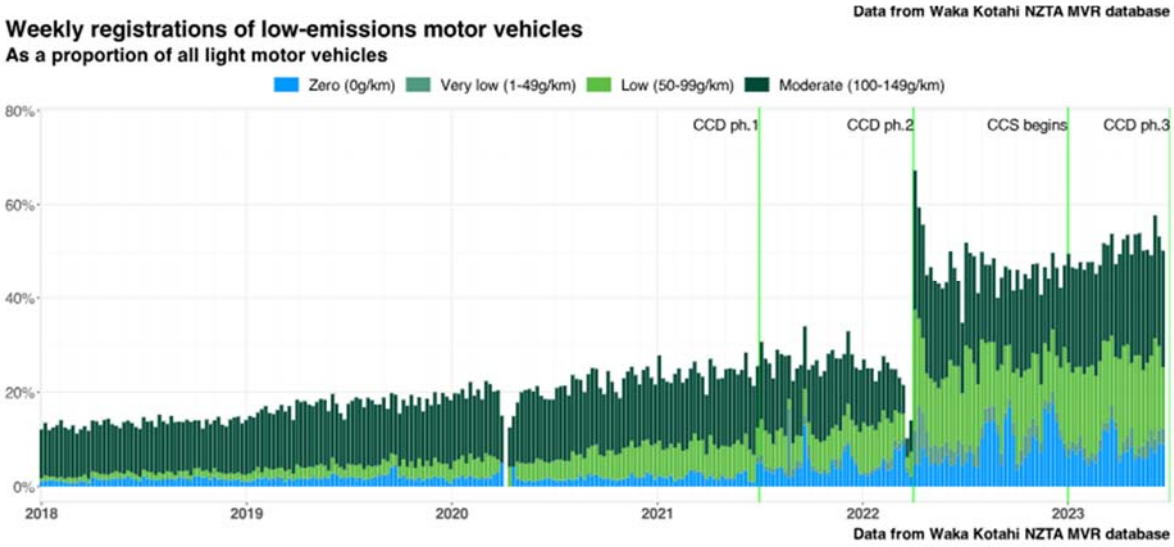

Figure 1: Registrations of low emissions vehicles

105 Looking at other countries (akin to New Zealand) that are focussing on EVs as part of their emissions reduction plans, Norway is a world-leader, with EVs now making up approximately 80% of new

[11] https://www.stuff.co.nz/motoring/129246542/evs-past-the-tipping-point-for-mass-adoption

[12] https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/quarterly-fleet-statistics/

vehicle registrations[13]. This shows the rate of EV uptake that could be possible in New Zealand, with the right incentives.

106 By the time that PC31 is developed, I believe it is reasonable to expect that a significant proportion of vehicles in the New Zealand fleet will be electric.

107 I also expect that the rate of uptake of EVs is likely to be higher than the national average in the PC31 area, for the following reasons:

107.1 New housing allows for the additional electrical demand that EV charging requires to be more easily accommodated. For instance, it can be challenging in an older home to charge a vehicle, given electrical capacity limitations[14].

107.2 There is a strong economic incentive, via fuel cost savings, to choose an EV instead of a traditional internal combustion engine vehicle in "commuter-belt" areas such as Ōhoka, where the daily commute distance is over 20km and where the round-trip distance is not so long that range anxiety becomes an issue.

108 I note that RIDL has specified a requirement that dwellings are EV charging ready (either via a district plan rule or Outline Development Plan (*ODP*) requirement for a consent notice at subdivision stage).

109 I consider this will support a reduction in GHG emissions.

Public Transport

110 Reducing vehicle travel emissions from PC31 (to Christchurch City, Rangiora and Kaiapoi) can be supported by developing connections between the PC31 site and the public transport network.

111 Presently, there are no public transportation options which pass directly through Ōhoka (besides school-related services). This is explainable by the relatively low numbers of residents in the area currently.

112 I refer to and rely on the evidence of **Mr Milner**, who in his assessment has concluded that the PC31 site and wider Ōhoka community can be provided with appropriate public transport

[13] https://www.nytimes.com/2023/05/08/business/energy-environment/norway-electric-vehicles.html

[14] For instance - 7 kW chargers (required to charge a vehicle in a reasonable timeframe) require a 40 A circuit, which is less common in older houses. Charging may need to be managed carefully to avoid overloading the standard 62 A single-phase connection. Or a second line (additional electrical connection) may need to be added to an older home (which obviously adds cost).

services to link them to Rangiora, Kaiapoi and beyond to onward destinations in Christchurch.

Reasons for Travel

113 The most comprehensive data for the types of trips that people undertake in New Zealand is provided by the Ministry of Transport.[15]

114 The following charts from that study show the average distances travelled per day for different purposes during both weekdays and weekend days:

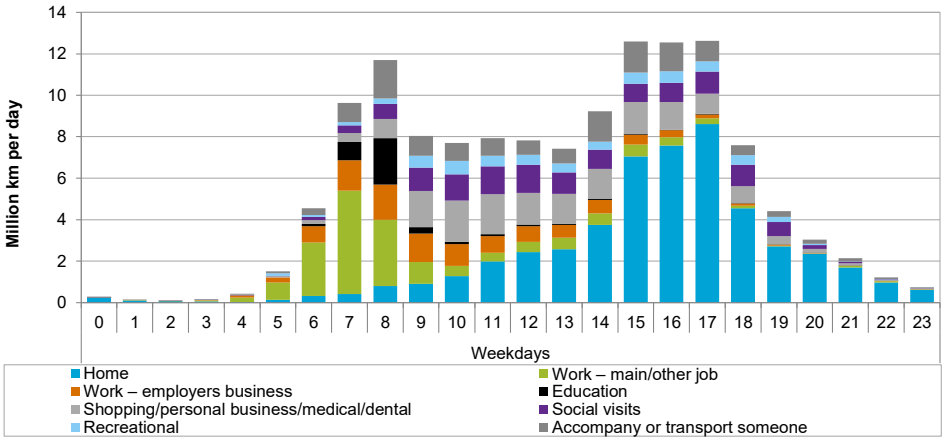

Figure 2: Why we Travel - Weekdays

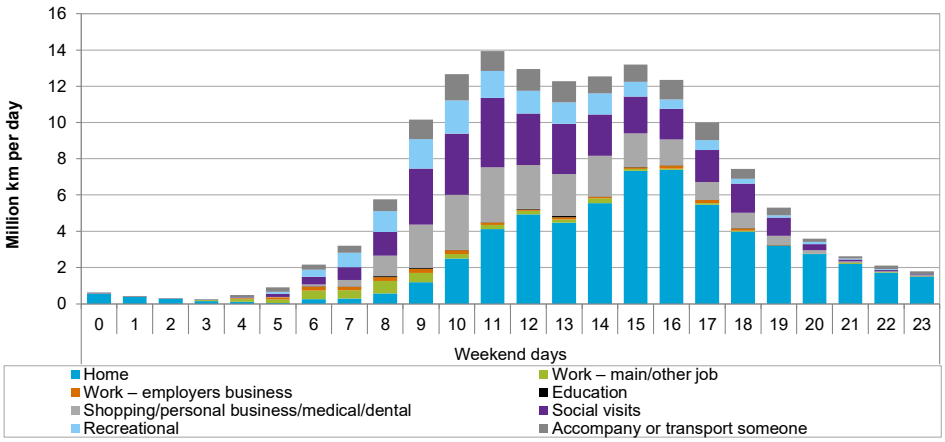

Figure 3: Why we Travel - Weekends

115 This shows that, on average, people travel further on weekend days than they do on weekday days, so the relative influence of

[15] Ministry of Transport. (2015). 25 Years of New Zealand Travel: New Zealand Household Travel 1989-2014.

commuting on overall travel emissions may be less than is commonly assumed.

116 It is notable that a high proportion of trips are for education, shopping, and recreation purposes.

117 Ōhoka is currently not well-serviced with amenities and recreation facilities, and it is reasonable to assume that currently most "high frequency" trips originating in the area are made to the most conveniently located destination for the purpose of the trip (e.g., nearest dairy/takeaway outlet/café) whereas trips to "destination" locations – such as heading to a larger supermarket for weekly shop – would occur less frequently.

118 The nearest medium-sized supermarket is located at Mandeville (approximately 4km), whereas the nearest large supermarket (Pak N Save) is located 7.3km away. These distances are relatively large distances compared to built-up urban areas.

119 Two commercial areas are planned for the development.

120 I would anticipate that tenancies in the commercial area proposed in PC31 will likely be self-selected, accounting for their likely desirability and convenience to nearby residents, and that these tenancies will be well utilised by PC31 residents. I expect that a convenience store (like a Four Square) could work well in this location and would minimise the requirement for residents to travel further afield for their day-to-day needs.

121 Additionally, the introduction of the proposed commercial area would benefit the existing residents of Ōhoka as well and could potentially reduce their travel-related emissions.

122 It is also likely, given the ODP design, that active modes of travel will be well used to access these facilities.

123 In terms of "education" trips, PC31 is relatively close (1.7 km) to Ōhoka Primary School, with a separated pathway that runs from the PC31 area to the school, along Mill Road. Ōhoka school caters for children up to year 8 (13-year-olds), so I expect that some trips to and from the existing school location from children who live in the plan change area would be via active modes (walking, scootering, or biking).

124 PC31 allows for a primary school to be located on the site and were this to occur then it is probable that an even higher proportion of trips to school would be via active modes. The plan change design incorporates active travel modes, and so I expect that these pathways would be well utilised for travel to a school, if located in the plan change area.

125 PC31 would be zoned for Kaiapoi High School, which is approximately 7.3 km distance, along a route that is not currently well suited to cycling.

126 However, there is an existing shuttle bus service that operates between Ōhoka and Kaiapoi High School, which would help to limit the emissions for school travel.

127 In addition:

127.1 PC31 includes the provision of shared paths along the site frontage of Whites Road and Bradleys Road; and

127.2 As described in **Mr Fuller's** evidence, the Council's recommended Walking and Cycling Network Plan indicates future cycle paths connecting Ōhoka with other parts of the District.

128 The above would assist with an increase in both education and other trips via active modes.

129 It would be beneficial if safe off-road access is provided to either, or both of Kaiapoi (approx. 9kms to New World Kaiapoi) and Rangiora (approx. 7.3kms to Pak N Save, and 10kms to central Rangiora).

130 These trips would not require any hills to be traversed and can be considered accessible via e-bike and e-scooter. Therefore, off-road access to Rangiora and Kaiapoi should be designed with these more recent forms of micromobility in mind.

131 There has been a substantial increase in the number of e-bikes in New Zealand,[16] with an estimate of between 100,000 and 200,000 across the country and a reported 50,000 imports in 2021. I expect the rise of e-biking to continue, and I believe that wider Christchurch is perfectly suited for this mode of transport and that we will see a significant proportion of trips in the region via e-bike over the next 10-20 years.

132 Research published by Waka Kotahi[17] in 2021 concludes, "*the usage of shared paths and separated cycle facilities will be three to eight times higher than for forecasts of pushbikes alone*".

133 And further: "*The growth in availability and ownership of micromobility will lead to an increase in public transport patronage*

[16] https://www.nzherald.co.nz/nz/on-your-bike-everything-you-need-to-know-about-e-bikes/QOHXNWYVPA2Q6AIE7J46AVBWTU/

[17] Mode shift to micromobility. February 2021. NZ Transport Agency research report 674.

by up to 7% in urban contexts and 9% in suburban contexts as a result of first/last mile micromobility use".

134 Therefore, the development of safe shared path and cycleway infrastructure between Ōhoka and Kaiapoi, as outlined in **Mr Fuller's** evidence, could increase the uptake of this mode of transport, hence, reducing emissions from vehicle use.

Alternative locations

135 Based on the evidence of Mr Jones, the typical buyer of a future PC31 dwelling is a buyer who wishes to purchase a single-dwelling property on a reasonable section size, relatively close to a major metropolitan centre. As per that evidence, the type of buyer is unlikely to choose a townhouse in Christchurch City and if they were unable to purchase a section/dwelling in Ōhoka, would look elsewhere in the Waimakariri District (or Selwyn District).

136 The PC31 site is located approximately 25km from the Christchurch Central City (defined as the Riverside market location). This is in line with other locations outside of Christchurch City that have greenfield development potential including Lincoln (22km), Rolleston (26km), West Melton (27km), Ravenswood (27km), Leeston (42km) and Amberley (46km).

137 However, I note, based on **Mr Walsh's** evidence, that there are number of constraints that may/will prevent development occurring across swathes of the Waimakariri District, particularly in areas in and around Kaiapoi. This includes the noise contours, land that is of cultural significance to local iwi, and land at risk of flooding in a severe rainfall events.

138 Given these constraints, there is a risk that if there is not an adequate availability of property with the characteristics described above in greenfield locations in the Waimakariri District relatively close to Christchurch City, such as in Ōhoka, buyers will purchase in locations further away from Christchurch City and other activity hubs (Rangiora and Kaiapoi). This could result in GHG emissions increases compared to the development of the PC31 site.

139 I note that a similar matter was covered in a recent Plan Change hearing in the Selwyn District, PC67, in relation to West Melton (a similar distance from Christchurch City as PC31). The commissioner, Mr Caldwell, stated in his recommendation (10 January 2022) that "*it is unlikely that if people are unable to purchase a single dwelling in West Melton, that they will move into Christchurch City. As discussed with Mr Metherell, those seeking the single dwelling option are more likely to go further afield within Selwyn to find it. In the case of West Melton, Darfield is a prime example. If such were to be a result of declining this plan change, then that could potentially result in a worse outcome from a greenhouse gas perspective".*

140 I agree with the commissioner and applying this in the context of Ōhoka, buyers may seek to purchase in areas such as Rangiora, or Ravenswood/Pegasus, each of which are further from Christchurch than the PC31 area.

Assessment

141 I consider that the conversion of the proposed land from rural to residential development, enabled by PC31, will lead to a reduction in emissions, because dairy cows will no longer be farmed on the land.

142 Importantly, it is emissions from methane (a gas known to have a much greater impact on global warming in the short-term compared to CO2) that will be reduced.

143 This should be taken into account when comparing this proposal against other greenfield developments, particularly where a greenfield development would convert land with currently low or negative emissions (e.g. a golf course, or tree covered area or cropped farm), to housing.

144 Additionally, based on the concept plans for the development, a greater level of sequestration will occur in future through the retention of as many existing trees as possible as the PC31 land is developed, and through the (significant) additional plantings as identified in the ODP.

145 The key wording in the *NPS-UD* relating to GHG emissions is that planning decisions "support reductions in greenhouse gas emissions" (Policy 1(e)).

146 I consider that, primarily due to the removal of dairy farming and its associated emissions from that the land, PC31 supports a reduction in greenhouse gas emissions.

147 RIDL have also taken several steps to support a reduction in emissions, including:

147.1 Tree planting throughout the PC31 area;

147.2 The provision of off-road pathways throughout the development, to support active (non-vehicular) travel;

147.3 The allowance for a school to be built within PC31;

147.4 The provision of two commercial areas within PC31 to meet some of the residents' day-to-day needs (reducing travel requirements);

147.5 Support for a public transport solution, as set out in **Mr Milner's** evidence; and

147.6 The specification of a requirement that dwellings are EV charging ready (either via a district plan rule or ODP requirement for a consent notice at subdivision stage). This will support a faster uptake of EVs within the PC31 area.

SECTION 42A REPORT

148 I have read the officer's report and make the following observations.

149 In paragraph 6.8.17, the officer refers to the evidence of Mr Binder regarding EVs. Mr Binder states that as of May 2023 EVs make up 1.7% of the New Zealand fleet. He does not consider the trend of uptake of EVs to be at a rate that they could be considered an effective mitigation for transport emissions within the foreseeable future.

150 I disagree with this conclusion. As noted earlier in my evidence, there has been a rapid increase in EVs in the New Zealand fleet since 2022; the financial incentive for owning an EV in a location like PC31 is significant; and RIDL is prepared to specify a rule to make homes EV ready. As such, I believe that the uptake of EVs in the PC31 area could contribute to a reduction in transport emissions.

151 Mr Binder also discusses PC31 and his view that there is insufficient provision of "day-to-day" activities within PC31. I agree that not all day-to-day activities will be provided in PC31, however the provision of a commercial area will provide for at least some of this activity. I am supportive of the inclusion of commercial development within largely residential plan changes from the perspective of reducing GHG emissions.

152 In Mr Binder's view, which I share, residents will need to access "day-to-day" activities in the nearest key activity centres of Kaiapoi and Rangiora. However, he considers these locations to be too far from PC31 to access via non-motorised forms of travel.

153 Mr Binder cites evidence from the New Zealand household travel survey (2015-2018) that on average New Zealanders will cycle 2.8km to shop. Given the timing of the household travel survey largely pre-dates the recent emergence of electric micromobility (e-scooters and e-bikes) in New Zealand, I consider that some New Zealanders would be prepared to travel further than 2.8km to shop, using motorised forms of non-road transport.

154 As such, I believe that were safe non-motorised connections to Kaiapoi to be provided, these connections could be utilised by residents (via e-bike and e-scooters) to access Kaiapoi for some of their day-to-day requirements. This would also likely be utilised by some high school students to access Kaiapoi High School.

CONCLUSION

155 I consider that the PC31 development 'supports a reduction in GHG emissions' (as per NPS-UD Policy 1(e)) due to:

155.1 The removal of dairying activity and its associated emissions from the PC31 land.

155.2 RIDL taking practical steps in the design of PC31 to support a reduction in emissions arising from the development and occupation of dwellings and commercial buildings, and emissions arising from transportation.

Dated: 7 July 2023

Paul Michael Farrelly