BEFORE HEARING COMMISSIONERS APPOINTED BY CANTERBURY REGIONAL COUNCIL AND WAIMAKARIRI DISTRICT COUNCIL

IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	Applications CRC204106, CRC204107, CRC204143 and RC205104 – to establish, operate and rehabilitate an aggregate quarry at 309 West Belt, Rangiora

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STATEMENT OF EVIDENCE OF JEFFREY BLUETT FOR TAGGART EARTHMOVING LIMITED

19 APRIL 2021

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1. INTRODUCTION

Qualifications and Experience

1.1 My name is Jeffrey Bluett. I hold the qualifications of a Bachelor of Science (University of Otago) and a Master of Science degree (First Class Honours) in Environmental Science (Lincoln University), specialising in air pollution modelling.

1.2 I am employed as a Technical Director: Air Quality by Pattle Delamore Partners Limited (PDP), an engineering and environmental consulting firm. I have been employed by PDP since April 2019 and have over 20 years of experience in the field of air quality matters, which includes Council and Environment Court experience.

1.3 I am a life member of the Clean Air Society of Australia and New Zealand (CASANZ). Within CASANZ, I currently hold or have held the following positions: Society Vice President (2019 to present), New Zealand Branch President (2018 to 2019), Society Council Member (2014 to present), New Zealand Branch Secretary (2014-18), and Transport Special Interest Group deputy chair (2009 to 2014). I was awarded CASANZ's distinguished service medal in 2013.

1.4 I have authored, or co-authored, approximately 100 reports and peer reviewed papers in respect of transport, industrial, domestic and agricultural emissions to air. In relation to monitoring and assessing the impacts of dust, my recent projects have included:

1.4.1. Leading the air quality assessment and air quality monitoring programme for a quarry expansion in Yaldhurst, Christchurch;

1.4.2. Leading a large research project for the New Zealand Transport Agency on understanding the effects of dust discharged from un-sealed public roads;

1.4.3. Monitoring dust discharged from a coal stockyard and coal mine haul roads;

1.4.4. Monitoring and assessing the impact of fibres discharged from a fibre board plant in Canterbury;

1.4.5. Assessing the impacts of dust discharged from two large and adjacent North Island limestone quarries;

1.4.6. Stakeholder contribution to the development of the Ministry for the Environment's Good Practice Guide for assessing and managing dust;

1.4.7. Assessing the impact of construction dust from the Northern Corridor Improvement Project (northern Motorway in Auckland); and

1.4.8. Technical lead - the construction dust section of CASANZ's Good Practice Guide for the Assessment and Management of Air Pollution from Road Transport Projects.

2. INVOLVEMENT IN THE PROPOSAL

2.1 I have been involved in this proposal since mid-2020. My ex-PDP colleague, Doug Boddy, wrote the initial air quality impact assessment for the proposal in 2018. I read and became familiar with that report in mid-2020. I co-wrote the responses to Canterbury Regional Council's s92 requests for further information (8 May 2020 and 22 December 2020). I assisted with the design, operation and data analysis of the dust and wind monitoring programme at the site which has run since 22 December 2020.

2.2 I undertook a site visit on 28 January 2020. The key objectives of the site visit were to become familiar with the site including the proposed quarry area and to visit the surrounding environment to understand the sensitivity of discharges to dust. During the site visit I inspected the air quality monitoring sites and observed the dust generated from the racetrack (during harness racing and when the surface of the track was being by prepared by tractor and chain drag.)

3. EXPERT WITNESS CODE OF CONDUCT

3.1 While this is a Council hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2014. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

4. PURPOSE AND SCOPE OF EVIDENCE

4.1 The purpose of my evidence is to address the impacts of dust from the proposal. Specifically, my evidence addresses:

4.1.1. The proposed dust generating activities;

4.1.2. The receiving environment;

4.1.3. The background dust monitoring undertaken;

4.1.4. The assessment undertaken of the potential dust impacts of the proposal;

4.1.5. The proposed dust mitigation and monitoring;

4.1.6. The submissions which raise air quality and health impact issues;

4.1.7. The s42A ECan Officer's Report in relation to air quality (including Appendix 3 to that report, written by Mr Richard Chilton); and

4.1.8. The proposed conditions of consent.

5. SUMMARY OF EVIDENCE

5.1 The proposed quarry is a small scale operation both in terms of maximum working area and because no aggregate processing will occur on site. Due to separation distances and surrounding land uses, the receiving environment is generally considered moderately sensitive to the discharge of dust. However, there are three highly sensitive receptors located between 130m and 160m from the western boundary of the site.

5.2 Wind conditions suggest that the potential downwind exposure of individual sensitive receptors to dust discharged from the proposed quarry varies between very frequent and infrequent. The pathway effectiveness between the quarry and individual receptors is assessed as moderately effective or ineffective.

5.3 Based on the scale of dust emissions, frequency of exposure and pathway effectiveness, the dust risk assessment concluded that the nuisance impact of dust discharged from the quarry beyond the site boundary will be less than minor.

5.4 With regard to the potential adverse health effects of dust (PM_{10}, $PM_{2.5}$ and RCS), any off-site concentrations are expected to be well within the relevant human health guidelines and standards. Therefore, any negative impacts on human health impacts have been assessed as less than minor.

5.5 A comprehensive air quality management plan (AQMP) has been drafted which when implemented will provide an effective, transparent, responsive and continuous improvement process for dust management. Implementation of the AQMP will ensure any adverse dust effects will be less than minor.

5.6 The ECan review of the air quality assessment and subsequent information supplied in response to the s92 request for further information concurs with the conclusions in PDP's air quality assessment that any adverse effects will be less than minor.

5.7 A majority of the submissions in opposition to the proposed quarry are based on air quality and/or health concerns. I have summarised the key issues raised in the submissions and provided information that demonstrates any effects that the submitters are concerned about will be less than minor. ECan's review of the air quality submissions reaches a similar conclusion.

5.8 ECan has reviewed the applicant's proposed set of conditions for the air discharge consent and recommended a small number of amendments. Generally, I agree with the proposed amendments to the proposed consent conditions recommended by ECan. The one exception is that ECan are recommending the covering of truck and trailer units being used to transport the aggregate from the quarry to the Cones Road processing area. Taggart does not consider this is necessary for the reasons explained by Mr Paul Taggart in his evidence, and I do not consider that covering of loads is required in relation to this proposal given the material involved and the short distance and speed to be travelled.

5.9 I consider that, providing the proposed conditions of consent are complied with, there are no air quality reasons why these consents cannot be granted.

6. DUST GENERATING ACTIVITIES

6.1 The total area of the proposed quarry is approximately 14.6ha with a maximum of 2ha active quarry at any one time. Taggart propose to extract a maximum of 750,000m^3 or 1.125 million tonnes of material from the site at an average rate of 50,000 tonnes per year over 15 years. In my experience this is considered to be a small scale quarry.

6.2 The proposed activities that have the potential to generate dust are:

- Site preparation and restoration;
- Gravel extraction – two excavators or one scraper;
- Gravel handling and movement – up to three truck and trailer units;
- Vehicle movements (a maximum of 240 vehicle movements per day); and

- Two stockpiles (containing 34,500m^3 of material).

6.3 Unlike at a typical quarry, and an important feature of this proposal, no gravel processing will occur on site. Therefore, the nature of the dust discharged will be determined solely by the base material being extracted and will be comprised mainly of larger dust particles of >30 µm in diameter. The impacts of dust of this size are limited to nuisance effects.

6.4 I consider the key dust generating activities, in order of the amount of dust discharged, to be:

- Vehicle movements – especially on un-consolidated surfaces;
- Gravel handling; and
- Gravel extraction.

Dust Suppression and Water Supply

6.5 The key strategy for dust suppression will be the application of water to the surfaces which have the potential to generate large amounts of dust.

6.6 Water supply for dust suppressant purposes is proposed to be sourced from the Racecourse. Consent CRC160231 (from bore M35/9270) provides for a volume of 6,237m³ in any seven consecutive days, with a volume not exceeding 122,040m³ per year for dust suppression purposes. A total volume of 122,040m^3 per year equates to a weekly average of 2347m³. The Ministry for the Environment's Good Practice Guide for Assessing and Managing the Impacts of Dust[1] recommends using 1 litre per square metre per hour as a conservative starting point for estimating the amount of water which is potentially required for dust suppression at a specific site.

6.7 The proposed disturbed area of the active quarry will be a maximum of 2ha (200,000m²) at any one time. An application rate of 1 litre per square metre per hour for 12 hours a day will require a total of 18 cubic metres of water per day. Assuming that dust suppression is required 7 days per week, then the total water demand is 126m^3 per week. This volume is equivalent to 5% of the weekly average water availability provided by Consent CRC160231.

6.8 I understand that the Rangiora Canterbury Jockey Club Inc and Rangiora Harness Racing Club Inc's water use for

[1] Ministry for the Environment, 2016. Good practice guide for assessing and managing dust. Publication reference number: ME 1277.

irrigation and dust suppression is significantly below the available water. From this, I estimate that the cumulative volume of water taken by the Incorporated Clubs and the proposed quarry will be well below that provided by Consent CRC160231. I conclude that there will be more than sufficient water to enable effective dust suppression for both the racecourse activities and the proposed quarry, and for the rehabilitation of worked quarry areas.

7. RECEIVING ENVIRONMENT

7.1 The proposed quarry is located at 309 West Belt, Rangiora (within the Rangiora racecourse) which is located approximately 200m northwest of the boundary of Rangiora. The area immediately adjacent to the site is mainly rural agricultural activity which I consider has moderate to low sensitivity to the impacts of dust discharged from the proposed activity. A total of 15 potentially highly sensitive receptors have been identified within 1 km of the proposed site boundary as shown in Figure 1. Nine of these receptors are within 300m of the site boundary. These are generally located on two roads which run to the east (West Belt) and to the west (Lehmans Road) of the proposed quarry.

7.2 Due to their proximity to the proposed quarry, there are two properties which I consider to be highly sensitive to the impacts of contaminants discharged from the proposed quarry. These are 337 Lehmans Road (R1), the Rangiora Holiday Park which has a population of permanent and temporary residents, and 359 Lehmans Road (R2) which I understand is a lifestyle bock complete with residential dwelling.

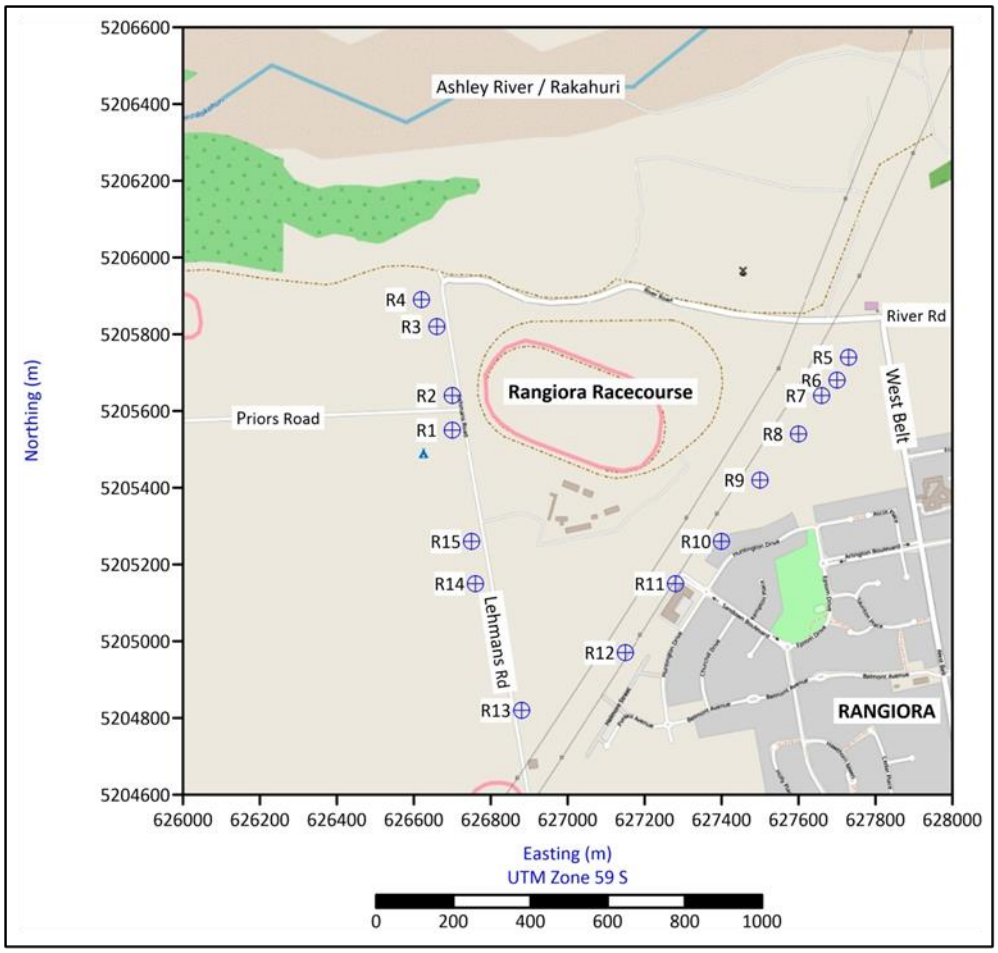

Figure 1. Location of The Project Site and Sensitive Receptors

7.3 There are two key meteorological variables that determine the risk of dust events occurring. Rainfall suppresses dust emissions very effectively - the drier the ground, the greater the potential dust emissions. Wind speed also has a significant impact on dust risk. The higher the wind speed, the greater the energy contained in the air parcel and the better it is at picking up and/or transporting larger dust particles.

7.4 I consider Rangiora to have a relatively low rainfall. Analysis of the hourly rainfall data indicates that over the five-year period there was little to no rainfall (<0.1mm) for 92% of the time, and that 'light' rainfall (0.1mm to 2.0mm) and 'moderate' rainfall (2.1mm to 6.0mm) occurred only 6.9% and 0.6% of the time respectively.

7.5 In my experience, windspeeds of greater than 7m/s are generally accepted as the minimum speed at which significant amounts of dust (>30 µm in diameter) can be picked up from a surface and transported any distance. To provide a conservative approach for this assessment, I have used a baseline windspeed of 5m/s. My analysis of the wind data from the Rangiora EWS (2013 to 2017) shows that

windspeed is above 5.5m/s for 7.7 % of the time (650 hours per year). Approximately 60% of the winds above 5m/s come from the south-west direction.

7.6 In my opinion the existing air quality around the proposed site is likely to be a typical of a semi-rural or peri-urban site. Contaminant emissions from combustion or chemical processes are likely to be very low. However there are some background sources of dust, namely:

- The Racecourse surface and unconsolidated vehicle tracks;
- Ashely Riverbed; and
- Agricultural activity on surrounding land.

8. BACKGROUND DUST MONITORING

8.1 To identify the sources of (and to quantify the impact of) background dust, an onsite air quality monitoring programme was commissioned on 22 December 2020 and has run since. The equipment installed was a continuous TSP monitor and meteorological instruments which measure wind speed, wind direction and temperature.

8.2 For the period of 22 December 2020 to 27 January 2021, the monitor was located approximately 200m to the south-east of the racetrack. This site (Site 1) was selected to monitor the impact of the dust from the racetrack during north-west winds. For the period of 27 January to 16 March 2021, the monitor was located approximately 100m to the north-east of the racetrack (Site 2). Site 2 was selected to monitor the impact of the dust from the racetrack during south-west winds and to monitor the impact of the dust from the Ashley Riverbed during any wind direction in the nor-west to the nor-east sector.

8.3 On 17 March 2021, the monitoring site was relocated to the west of the track adjacent to Lehmans Road and the holiday park (Site 3). Site 3 aimed to measure the current impact of dust from the racetrack on the holiday park during winds from the easterly quarter.

8.4 There are some limitations of the dust and meteorological data set collected at the proposed site. The key limitations are that the dust and meteorological data were collected using non-NES compliant methods and that the data record is only four months. However, the monitoring methods used and data collected align with accepted good practice for a short term air quality investigation. In summary, PDP consider that the data is fit for use in this evidence.

8.5 The key findings I drew from the data collected at monitoring Site 1, Site 2 and Site 3 are:

- TSP concentrations are generally low - typical of background dust levels in a rural environment they are about 10 µg/m^3 or below;
- A low number of short term relatively high (>20 µg/m^3) impacts have been observed. The source appears to be located to the E or SE of the racetrack;
- No impact of river dust was observed at Site 1 or Site 2. At Site 3 there was one NW wind event that appears to have transported a small amount of TSP (5 µg/m^3) from the riverbed to the monitor; and
- A small impact of around 12-14 µg/m^3 TSP from the racetrack dust can be observed when the monitor is within 100m of the track.

9. ASSESSMENT OF DUST IMPACTS

9.1 The two key potential adverse effects which dust can have are effects on amenity values (TSP) and human health (PM_{10}).

Impacts on Amenity Values

9.2 The impact of dust emissions on amenity values was assessed using a semi-quantitative risk method which considered the size and type of the proposed quarry, proposed mitigation measures, meteorological conditions, sensitivity of receptors and distance to receptors.

9.3 The key results from the semi-qualitative dust risk assessment were:

9.3.1. The source dust emissions were predicted to be small for each dust-generating activity;

9.3.2. The frequency of the impacts on individual potentially sensitive receptors varies between very frequent and infrequent; and

9.3.3. Pathway effectiveness between source and receptor is either moderately effective or ineffective.

9.4 Based on these results, the risk assessment concluded that the nuisance impact of dust discharged from the quarry beyond the site boundary would be negligible.

9.5 However, given there are a number of sensitive receptors between 130m to 200m from the site boundary (specifically

on Lehmans Road and to a lesser degree on West Belt), a dust monitoring and mitigation programme has been proposed in order to minimise effects and to ensure that the actual dust impacts will be negligible on relatively close receptors.

Impacts on Health

9.6 The potential for health impacts from quarries relates to the finer size fractions of particles contained within dust generated from quarrying activities.

PM_{10}

9.7 In the Air Quality Impact Assessment, potential health impacts of the discharge of dust were assessed using a qualitative method. In that report, PDP concluded that there will be no exceedances of the National Environmental Standard for Air Quality (NESAQ) or Ambient Air Quality Guidelines (AAQG) for PM_{10} beyond the site boundary of the proposed site including the Rangiora airshed, provided that the mitigation measures are implemented. Given that no gravel processing will take place on site, I consider the likelihood of large amounts of PM_{10} being discharged is minimal and the potential adverse health impacts of the proposed activity will be less than minor.

9.8 Since the Taggart application was submitted, ECan have published the outcomes of the Yaldhurst quarry monitoring programme[2]. I consider that this study provides a comprehensive and good quality data set which quantitatively validates the conclusions in the Air Quality Impact Assessment for this proposal.

Mote Study

9.9 Mote (2018) reported on an air quality monitoring campaign undertaken at a number of sites in and around the Yaldhurst Quarry area for four months from 22 December 2018. The purpose of this monitoring was to:

9.9.1. Determine if the levels of RCS at residences in close proximity to the existing quarries in Yaldhurst exceed the annual ambient guideline for RCS; and

9.9.2. Characterise the nature of particulate by measuring short-term (hourly) and long-term (24-hour and three-month) particulate levels and measuring different size fractions of particulate at multiple locations.

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[2] Yaldhurst Air Quality Monitoring Programme – Summary Report: 22 December -21 April 2018. Report prepared by Mote Limited for Environment Canterbury 2018.

9.10 The size of the Yaldhurst quarries is significantly larger than that proposed by Taggart (230ha compared to 14.6ha). The scale of the Yaldhurst quarries operation is significantly larger and more process intensive with at least 4 screening and crushing plants operating at any one time. Therefore, the concentrations of contaminants measured adjacent to the Yaldhurst quarries will be significantly higher than those experienced in close proximity to the proposed Taggart quarry.

9.11 The aggregate (greywacke gravels) being quarried at the Yaldhurst quarries is also identical or very similar to that proposed by Taggart.

9.12 The dust sensitivity of the receptors (residential properties) located close to the Yaldhurst quarries is high and mirrors the sensitivity of the Lehmans Road properties to the effects of dust.

9.13 The Yaldhurst monitoring programme included six sites which were monitored for PM_{10}, six sites monitored for respirable crystalline silica (RCS), three sites monitored for $PM_{2.5}$ and a meteorological monitoring site.

9.14 The locations of the monitoring sites used for the Yaldhurst quarries ranged between 50m and 190m downwind from the boundary of the quarry area. By comparison, the Lehmans Road residential properties (those nearest the quarry) will be at least 130m downwind from the boundary of the Taggart quarry. Therefore, the concentrations measured at some of the Yaldhurst sites in the Mote study are a similar distance downwind as the Lehmans Road residential properties would be from Taggart's proposed quarry.

9.15 The Yaldhurst study was undertaken over a period of four months (December 2017 to April 2018), which is not a sufficiently long enough period to accurately assess annual average concentrations. However the monitoring programme was undertaken over the period of the year with the highest potential for dust events (dry and windy conditions). Therefore the annual average concentration will be lower than that measured over the four-month monitoring period, which was well below the annual average guideline for PM_{10}.

9.16 The key conclusion that can be drawn from the Yaldhurst monitoring data is that PM_{10} concentrations measured at a distance of greater than 160m from the quarry boundary show very little impact from the quarry compared to data collected at a background site. Given that the Yaldhurst quarry is significantly larger than the proposed Taggart quarry and that no crushing will be carried out on site, I conclude that any potential health impact of PM_{10} at the

sensitive receptors on the southern section of Lehmans Road, in Arlington Estates or on West Belt will be less than minor.

9.17 In summary, my opinion is that the Mote Yaldhurst report is relevant (albeit conservative) and informative for the purposes of considering any health impacts from the discharge of PM_{10}, $PM_{2.5}$ and RCS from the Taggart proposal.

9.18 A summary of the health impact assessment based on the Yaldhurst data is presented in Appendix 1 to my evidence: Dust Health Impact Assessment. The key findings of the assessment of $PM_{2.5}$ PM_{10} and Respirable Crystalline Silica (RSC) are described in the following paragraphs.

9.19 The monitored concentrations of PM_{10}, $PM_{2.5}$ and RCS at the Yaldhurst test sites confirm the quarry contribution of these contaminants to overall concentrations of PM_{10}, $PM_{2.5}$, and RSC at a separation distance of 250m or more from quarrying activities will be negligible and well below the respective health impact assessment criteria. Based on this data, I conclude that at the sensitive receptors on West Belt, in Arlington Estate and on the southern section of Lehmans road, any adverse health effects will be less than minor (negligible in the assessment method terminology).

9.20 There are three properties that are between 130 and 150m of the nearest dust generating activity in the proposed quarry. These properties are 337 Lehmans Road (R1) 359 Lehmans Road (R2) and 373 Lehmans Road (R3). I note that 337 Leahmans Road is the Rangiora Holiday Park which has a population of permanent and temporary residents.

9.21 My analysis of the of PM_{10}, $PM_{2.5}$ and RCS data from the Yaldhurst study's site 6, and background test sites, suggest that for those 3 receptors, any potential adverse health effects due to dust and particulate emissions from the quarry will also be less than minor because ambient concentrations of PM_{10}, $PM_{2.5}$ and RCS will be well below the relevant human health guidelines.

10. CUMULATIVE EFFECTS

10.1 The dust monitoring information presented in Section 8 of my evidence demonstrates that at the proposed site, the current background concentrations of dust are at levels typically experienced in a semi-rural, peri-urban environment. Despite the potential dust emissions from the Ashley Riverbed, the surrounding agricultural area and the racetrack, the on-site dust monitoring indicates no significant impact of any other sources of dust at or around the site.

10.2 A detailed assessment of cumulative effects has been undertaken by PDP[3] based on the data collected in the Yaldhurst study and from the on-site monitoring undertaken. Based on this data, I consider that the potential for any appreciable cumulative dust effects are low.

10.3 The boundary of the Rangiora airshed is situated approximately 185m south-east of the nearest dust-generating activities of the proposed quarry. Given the outcomes of the transect investigation included in the Yaldhurst study and the much larger size of the Yaldhurst quarry (230ha of unpaved surfaces) in comparison to the proposed Taggart quarry (5ha of unpaved surfaces), I conclude that any increase in PM_{10} within the Rangiora airshed due to the emissions from the proposed Taggart quarry will be well below 2.5 $\mu g/m^3$ (24-hour average). Therefore, this proposal does not meet the threshold as defined in Section 17 of the NESAQ which requires the offsetting of PM_{10} emissions within a polluted airshed.

10.4 I consider that the quality and quantity of information I have used to assess the cumulative effects is sufficient for me to provide the opinion that the "lived experience" of dust for the residents near the proposed quarry is most likely to be normal or very close to normal for a semi-rural, or peri-urban environment. The method of assessment I have used and my conclusion is consistent with the Harewood Gravels Environment Court decision (2017 NZEnvC 165).

11. DUST MONITORING AND MITIGATION

11.1 A key part of the dust management system will be automated irrigation systems and Taggart staff (manual systems).

11.2 The site's dust and monitoring management system will be detailed in Air Quality Management Plan (AQMP), a draft of which has been developed by PDP and is presented in Appendix 2 to my evidence: Draft Air Quality Management Plan. The key aspects of the AQMP are:

11.2.1. Continuous dust monitoring;

11.2.2. Continuous meteorological monitoring;

11.2.3. Visual dust monitoring;

11.2.4. Dust and wind trigger alerts for dust mitigation;

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[3] Taggart Earthmoving Limited Application- Response to S 92 Requests. 27 January 2021.

11.2.5. Standard Operating Procedures (SOPs) for mitigating dust from the site's seven key sources of dust. These include a three-tiered approach to dust mitigation measures for each separate dust source and automated and manual water suppression systems;

11.2.6. Water volume and supply strategy;

11.2.7. Complaint receipt and response procedures; and

11.2.8. Reporting and review procedures.

11.3 The AQMP represents best practice as defined by the Ministry for the Environment's and ECan's guidance on this management tool. The AQMP will ensure that there will be no offensive or objectionable dust beyond the boundary of the site. The reporting requirements of the AQMP will ensure that the plan is implemented in an effective and transparent manner. The review requirements will ensure that any updates or upgrades to dust mitigation systems will be identified and implemented in a timely manner.

12. RESPONSE TO SUBMISSIONS

12.1 A majority of the submissions made refer to air quality and/or health effects of air quality. I have reviewed these submissions. The key issues raised are summarised and, to the extent that I haven't addressed them already in my evidence or wish to make further comment, are addressed below.

Health Impacts of Dust and Respirable Crystalline Silica (RCS)

12.2 Concerns over the health impacts of dust, including PM_{10}, $PM_{2.5}$ and RCS, was the most common issue raised in submissions on air quality. I have addressed the potential human health impacts of these pollutants in Section 9 and Appendix 1 of this evidence, in which I state that I consider that any air quality health impacts from quarrying activities will be negligible and well below the respective health impact assessment criteria.

12.3 A common feature of these submissions was that the young, elderly and health compromised sections of the population suffer from exacerbated effects from these pollutants. The health impact guidelines for PM_{10}, $PM_{2.5}$ and RCS used in this assessment have been developed to protect the susceptible sectors of the demographic.

12.4 One submitter suggested there was a lack of research to inform air quality health guidelines. I know that both in New Zealand and internationally, significant effort is invested by health professionals into developing health guidelines using

the best available information. Each guideline is supported by numerous studies which are used to define exposure concentrations and time periods. The health guidelines are developed by appropriately qualified and experienced experts, using the best available information, and I consider that these can be relied on.

12.5 The health impact of dust on animals, including pets and racing horses, was questioned by a number of submitters. In my experience with other (some much larger) quarries, I have not observed or been made aware of animal health impacts which have occurred from the discharge of dust, either by inhalation or by feeding on vegetation with dust on the surface. I consider that that if human health guidelines are complied with, the risk to animal health will be low.

Nuisance Impacts of Deposited dust

12.6 Concerns over the nuisance impacts of deposited dust impacts of dust was also a common issue raised by submissions on air quality. Specifically, submitters noted worries over dust being deposited on building surfaces and drying laundry and being sucked into ventilation systems including heat pumps. The deposition of dust on vegetables, fruit and flowers was another concern raised by submitters. The submitters highlighted that the main consequences of this impact were increased cost and the effort of more frequent cleaning and maintenance.

12.7 Nuisance dust discharged from any quarry is very unlikely to be transported more than 200m from the source. Therefore, the spatial extent of any potential nuisance dust impact from the proposed quarry is limited to receptors within a 200m radius of the source. Given the small scale of the proposed activity and that there will be a comprehensive and effective mitigation and monitoring programme, it is my opinion that any nuisance dust impact occurring within 200m of the quarry will be less than minor.

12.8 One submitter highlighted the potential impact of visible dust plumes on the Rangiora flight path. Rangiora airfield is located approximately 1.5 km to the west of the proposed quarry. The airfield is boarded by the Ashley riverbed to the north. I consider the Ashley riverbed a much larger, closer and significant source of dust than the proposed quarry. In my opinion the cumulative effect of dust from the quarry and riverbed on the airfield will not be distinguishable from the riverbed alone. Pragmatically I consider the risk of the visible dust plumes on the Rangiora flight path will not increase due to the proposed quarry.

12.9 Two submitters were concerned that no action would be taken by councils in response to dust complaints or other

dust issues. This is not my personal experience. I have observed council monitoring officers being responsive and effective in dealing with complaints of both odour and dust problems.

12.10 Submitters raised concerns over the proximity of the proposed quarry to sensitive receptors including residential properties, child day care facilities, rest homes, schools, churches and businesses. Sensitive receptors have been identified in my assessment.

12.11 A number of submitters suggested that travel distances for dust from quarries can be between 500m and 1,500m. This is not consistent with my experience or with the data collected in the Yaldhurst study.

12.12 The urban development and associated community facilities on West Belt and in Arlington Estates are all more than 300m from the boundary of the proposed quarry. Given the scale and type of the proposed activity, I consider the buffer distance proposed is more than adequate to ensure any health or nuisance impacts are less than minor.

12.13 A number of submitters considered the Victorian Environmental Projection Authority (VEPA) recommended buffer distance of 500m as being appropriate for this application. The key to the use of the VEPA buffer distance is that it is recommended as being applicable to quarries that discharge RCS. As noted above in Section 9 and Appendix 1, due to the scale and type of proposed activity, there will be negligible RCS discharged from the proposed activity. Therefore, in my opinion the use of the VEPA buffer distance is not appropriate for this proposal.

12.14 One submitter (Rangiora Ashley Community Board) noted the distance to the Rangiora NESAQ - gazetted airshed was approximately 250m. That submitter went on to suggest that the impact of PM_{10} discharged from the proposed quarry would need to be quantified to ensure that the requirements of Section 17 of the NESAQ would be met. I have addressed this in paragraph 10.3 of my evidence and Mr Chilton agrees with my conclusion[4].

12.15 One submitter suggesting moving the site access road (off River Road) and the stockpiles (located on the north-eastern corner of the site) to provide a greater separation between those and any sensitive receptors. The location of both the site access road and the stockpiles provides a buffer distance of at least 300m from any sensitive receptor. In my

[4] Para 56 of his report.

opinion this is a pragmatic compromise between site function and providing effective buffer distances.

Meteorological data used in the assessment

12.16 Some submitters raised concerns over the meteorological data used in the air quality assessment. The key issues raised were that:

12.16.1. Data recorded at the Rangiora Electronic Weather Station (EWS) (Agent No. 17244) located approximately 5.5km to the south-east of the proposed site was inappropriate for use in the assessment;

12.16.2. There was an apparent lack of high-speed winds in the data used– especially from the NW;

12.16.3. Not all prevailing winds were shown in the data;

12.16.4. The data presented in the Impact Assessment (2013-17) was not a sufficient period to use and not appropriate for 2021; and

12.16.5. Comparisons of the data with NIWA and University data sets showed inconsistencies.

12.17 To address these concerns, I undertook some additional analysis on wind data from the Rangiora area. I generated a wind rose for 2013 to 2017 for the ECan meteorological site located at St Joseph's School in Rangiora and compared that to the wind rose from the EWS site (operated by NIWA) for the same period. This comparison showed a very similar pattern of wind directions with predominant winds being from the NE and SW and an infrequent occurrence of NW winds 4%. The windspeeds recorded at the ECan site showed a much higher frequency of low wind speeds (<3m/s) than those recorded at the EWS site. Given the urban setting of the ECan site, this observation makes sense. The observed speed difference suggests that the higher windspeeds recorded at the EWS are likely representative of those experienced in the rural area around Rangiora.

12.18 I generated a wind rose for the period 2018-21 for the data collected at the Rangiora EWS and compared that to the 2013-17 wind rose for the same site. This comparison showed a very similar pattern of wind directions and wind speeds for the two time periods.

12.19 The comparison of wind roses from two sites and two time periods shows that the EWS data used in the assessment is representative for the proposed site in both a spatial and temporal sense.

12.20 Another submitter commented that the data was not consistent with data collected and analysed by the University of Canterbury (UC). I note that the UC paper[5] that the submitter referred to was on windier smog nights in Canterbury and therefore will not show similar wind patterns as experienced at the EWS.

12.21 Having reviewed the submissions and undertaken some additional data analysis, I conclude that the EWS wind data 2013-17 employed in the Impact Assessment is appropriate for this purpose and is representative of the conditions occurring at the proposed site.

Dust Monitoring

12.22 Some submitters raised concerns over the effectiveness of the proposed dust mitigation and monitoring measures.

12.23 One submitter suggested that the bunds be built during the wetter months of the year and that they be grassed to ensure a minimum of at least 85% surface cover. This is good practice and I understand will be proposed as a condition of consent. Several submitters questioned the effectiveness of a 3m high bund. In my experience a 3m high bund for a site of this size and receiving environment is appropriate.

12.24 A small number of submitters suggested that bunds increased the risk of dust impacts as winds accelerated over the top of the bund and took additional dust with it. I have not observed this effect and note that as long as the surface is grassed, there is minimal additional dust which can be picked up by any wind that may have accelerated as it moves over the bund. The other factor to consider is that a low-pressure zone will develop on the lee side of the bund which will be effective in pulling the wind stream back down to ground level thus reducing the distance dust may be transported past the bund.

12.25 A number of submitters suggested automated water sprinkler systems would be required by the site to ensure adequate dust suppression. These form part of the proposal. Having an automated sprinkler system which is triggered by wind or dust monitoring systems will also address submitters' concern about dust mitigation during out of operational hours.

12.26 One submitter questioned if the monitoring of TSP was appropriate and suggested that PM_{10} monitoring would be more useful. TSP is being monitored currently in the lead up

[5] Kossmann M and Sturman A, 2004. The surface wind field during winter smog nights in Christchurch and costal Canterbury Christchurch. International Journal of Climatology, 24:93-108.

to the hearing. As noted in the Section 13 of my evidence the operational dust monitoring programme proposed for the site will monitor PM_{10}.

12.27 Other submitters suggested that multiple dust monitors would be needed. I recommend that one monitor be installed on the boundary of Lehmans Road. Any other dust monitoring locations will be detailed in the site's AQMP, which will be reviewed by ECan before the activity commences.

12.28 A number of submitters suggested that the monitoring be undertaken by an independent party. Taggart is likely to contract the monitoring to a suitably qualified and experienced provider, however the installation, operation, maintenance and data reports produced will be made available to ECan upon request. This will enable an independent review of the monitoring and data collected to be undertaken and to ensure that the consent conditions are being complied with.

Dust Mitigation Measures

12.29 One submitter noted the close proximity (~150m from the proposed quarry) of four sensitive receptors located on Lehmans Road. These receptors are labelled R1 to R4 in Figure 1. The submitter suggested that Taggart consider additional and specific mitigation to reduce the dust risk for these relatively close receptors. Mitigation measures are already proposed to protect receptors R1 to R4. These measures include:

12.29.1. An Internal buffer distance of at least 100m when winds are blowing from the east or NE and are above 5m/s; and

12.29.2. A continuous dust monitor will be installed close to the western boundary with Lehmans Road. The monitor will be used to trigger a tiered mitigation response which will be detailed in the AQMP. A tier one alert will ensure that the internal buffer distance is in place and that additional water suppression occurs. A tier two alert will be a stop work notice and an investigation into the dust sources and mitigation processes.

12.30 Submitters highlighted the potential effects of dust generated from the extraction and transportation of aggregate. I consider that the extraction of the gravel either by excavator or by motor driven scraper will not be a significant source because the material excavated will not contain a large proportion of fines and it will contain moisture which will suppress any dust emission. Dust generated by the transportation of aggregate on the site's

haul roads will be well controlled by ensuring that the roads are in good condition (free from corrugations and potholes) and when required they will be regularly wetted by the water cart. A maximum vehicle speed of 15km/hr will be implemented on site. The first 50m section of the access road will be sealed and have a rumble strip installed. This will provide an area upon which loose material carried by truck wheels will be deposited. This sealed section of roadway will be regularly cleaned to ensure that the amount of fines transported onto the public road is minimised. Given the nature of the site and the material being quarried, it is not anticipated that significant amounts of mud will be transported on the truck wheels even during winter. Therefore, the installation and operation of a truck wheel wash is not part of the proposal and I do not consider it to be necessary.

13. RESPONSE TO S42A OFFICERS REPORT

13.1 I have reviewed the s42A report and Appendix 3[6] of the s42A report prepared by Mr Chilton. In summary Mr Chilton and I agree on the key findings of the air quality assessment. Specifically:

13.1.1. If the proposed mitigation measures are implemented and monitored for their effectiveness, any adverse nuisance dust effects should be very low; and

13.1.2. Concentrations of the contaminants discharged into air from the proposed activity will be below the relevant health-based guidelines and standards.

13.2 In his report, Mr Chilton highlights a number of points of difference in opinion between he and I, and notes issues which he considers need to be addressed to ensure that the proposed mitigation measures will be effective. I address these points in the following paragraphs.

13.3 In paragraph 58 of his report, Mr Chilton highlights the potential for dust to be generated by the action of vehicle wheels on unpaved surfaces and notes that the Air Quality Impact Assessment does not identify this as an issue. I agree with Mr Chilton's comment and consider that not specifically addressing this potential dust source in that report was an oversight. However, Mr Chilton and I are in agreement that this source does not affect the report's conclusions because the mitigation measures proposed, including the watering of

[6] Addendum to Section 42A Officer's Report, Richard Chilton, 18 March 2021.

haul roads, will adequately control this source vehicle generated dust.

13.4 In paragraph 61 of his report, Mr Chilton refers to the amount of data available from TSP monitoring. As he notes, a more extensive dataset is now available. The results of that data are summarised in Section 8 of my evidence. Those results confirm:

13.4.1. Particulate concentrations are currently typical of a semi-rural environment;

13.4.2. A negligible impact of dust from the riverbed was observed; and

13.4.3. A small impact around 12-14 $\mu g/m^3$ of the racetrack dust was observed when the monitor is within 100m of the track.

13.5 In the response to s92 requests for further information, it was concluded based on ECan monitoring data that the Ashley River could be the source of elevated PM_{10} in the location of the site. In paragraph 65 of Mr Chilton's evidence, he explains why he disagrees on this point. Now having on-site monitoring data to consider, I am in agreement with Mr Chilton that it is not useful to use the ECan monitoring data to assess the impact of any PM_{10} discharged from the riverbed. My assessment of cumulative effects provided in Section 10 of this evidence is based on on-site monitoring data.

13.6 In paragraphs 67 and 70 of his report, Mr Chilton suggests that the full 140m of the site access road should be sealed, rather than the 50m proposed by Taggart. Given the nature of the site and the material being quarried, it is not anticipated that significant amounts of fine material will be carried by the wheels of vehicles travelling from the site. In my opinion 50m of sealed road and a rumble strip should be sufficient to provide an area upon which loose material carried by truck wheels will be deposited. The key issue is not the length of road that is sealed but limiting the material carried on to the sealed public road.

13.7 In paragraph 67 of his evidence, Mr Chilton recommends that all loads be covered, and he considers this to be standard industry practice.

13.8 I accept Mr Chilton's view that covering loads is generally accepted as standard industry practice. However, given the short travel distance to the Cores Road yard (1.4 km), the 80 km/hr speed limit, the low number of roadside houses and the low fines content of the material, I conclude there is very little benefit to be gained in covering loads being

transported from the quarry to the processing area. As such the applicant does not plan to use covered truck and trailer units to transport the material between the two points.

13.9 In paragraph 71 of his report, Mr Chilton suggests that the proposed continuous dust monitoring should measure PM_{10} rather than TSP and that other aspects of the monitoring programme should meet the requirements set by ECan on other recent quarry air discharge consents. I agree with Mr Chilton on this issue and recommend that the conditions of consent reflect the monitoring requirements set by ECan on other recent quarry air discharge consents including the on-site monitoring of wind conditions (see Section 14 below).

13.10 In paragraph 72 of his report, Mr Chilton addresses the way in which the dust mitigation trigger limits are set. Mr Chilton notes he ordinarily recommends that these limits are set via a site air quality management plan (AQMP) rather than being defined in consent conditions. Despite this, at paragraph 284 of her report, Ms Dawson states that if the applicant does not adopt her recommended consent conditions, specifically for the proposed trigger valves for PM_{10} monitoring, she considers that there could be nuisance and health effects that arise. I concur with Mr Chilton's recommendations that the AQMP be used to set the trigger limits.

13.11 In paragraph 73 of his report, Mr Chilton suggests that at least two dust monitors should be operated at all times. As noted in my paragraph 12.27, I recommend that a permanent monitor should be installed at the western boundary of the proposed site. However I am not convinced a second permanent monitor is needed. A second monitor may be helpful to quantify any impact on the West Belt or Arlington Estate areas. However, it is my opinion that a second monitor would only provide value when the location of quarrying is toward the eastern and southern boundaries of the site. I recommend that the AQMP be used to determine if and when a second dust monitor is required.

13.12 At paragraphs 74 to 79 of his report, Mr Chilton makes some recommendations on conditions of consent. I comment on recommended conditions of consent (including Mr Chilton's suggestions) in Section 14 of my evidence.

14. PROPOSED CONDITIONS OF CONSENT

14.1 A set of proposed conditions for the air discharge consent was submitted with the application. These have been discussed with ECan and refined over time.

14.2 Mr Chilton has reviewed the proposed conditions and recommends that the following requirements are integrated into the conditions of consent:

14.2.1. Windspeed criteria for the cessation of quarry activities (except dust suppression) be set at 7m/s as a one-hour average and only apply to dry days;

14.2.2. The installation, maintenance and operation of the on-site meteorological station be in accordance with the relevant New Zealand Standard (AS/NZS 3580:14:2014);

14.2.3. Routine use of the watercart to apply water for dust suppression;

14.2.4. The discharge of particulate matter from the site must not result in an offensive or objectionable effect beyond the site boundary;

14.2.5. Limiting the total working area of the quarry including excavation and backfilling to 2ha; and

14.2.6. Excluding the crushing or screening of aggregate on site.

14.3 I support Mr Chilton's recommendations in relation to consent conditions.

15. CONCLUSION

15.1 The proposed quarry is relatively small scale, both in terms of maximum working area and because no aggregate processing will occur on site.

15.2 Given this, the separation distances to sensitive receptors and the proposed mitigation and monitoring measures, any negative impacts on amenity values have been assessed as being less than minor.

15.3 With regard to the potential adverse health effects of dust (PM_{10}, $PM_{2.5}$ and RCS) any off-site concentrations are expected to be well within the relevant human health guidelines and standards. Therefore, any negative impacts on human health have been assessed as less than minor.

15.4 Generally, the outcomes of Mr Chilton's review of the air quality assessment align with the conclusions drawn by PDP on the potential amenity and health impacts of the particulate that will be discharged from the proposed activity.

15.5 In my opinion, there are no air quality reasons why the consents sought cannot be granted.

Jeff Bluett

19 April 2021

APPENDIX 1. DUST HEALTH IMPACT ASSESSMENT

1. HEALTH IMPACTS – PM_{10}

1.1 The most relevant PM_{10} data from the Yaldhurst quarry study for assessing the potential health impacts at Lehmans Road Arlington Estate and West Belt was monitored at Site 2 and Site 6 which were 190m and 160m from the Yaldhurst quarry boundary respectively. The third set of relevant data is from the background site (4.8 km from the quarries).

1.2 The key conclusions from the Yaldhurst study in regards to the health impacts of PM_{10} were that:

1.2.1. Maximum PM_{10} 24-hour average concentration at Site 2 and Site 6 were similar to that measured at the background site (58, 57 and 56 $\mu g/m^3$ respectively); and

1.2.2. The four-month PM_{10} concentration at sites 2 and 6 (21-23 $\mu g/m^3$) were only slightly higher than that measured at the background site (19 $\mu g/m^3$).

1.3 There are three properties that are between 130m and 150m of the nearest dust generating activity in the proposed quarry. These properties are 337 Lehmans Road (R1) 359 Lehmans Road (R2) and 373 Lehmans Road (R3). 337 Leahmans Road is the Rangiora Holiday Park which has a population of permanent and temporary residents.

1.4 The maximum 24-hour average monitored concentrations of PM_{10}, at Yaldhurst site 6 (160m from the boundary) and background site (4,800 m from the boundary) were very similar at 56 and 57 $\mu g/m^3$ respectively. These measurements were made with nephelometer type monitors which are not compliant with the requirements of the NESAQ. The Yaldhurst study compared the measurements made with nephelometers with beta-attenuation monitors (BAMs) which are compliant with the requirements of the NESAQ. This comparison showed that nephelometers over measured PM_{10} by about 20% in the Yaldhurst study. While the nephelometer data suggests concentrations of PM_{10} may have been above the NESAQ PM_{10} value of 50 $\mu g/m^3$, in my opinion all concentrations were likely to be below that NESAQ value.

1.5 Data was collected for 120 days at the Yaldhurst monitoring sites. The data shows there were 19 days (16%) at Site 6 and 12 days (10%) at the background site when PM_{10} 24-hour concentrations were above 30 µg/m³. In summary, the data shows that PM_{10} concentrations at site 6 are sometimes elevated above the background site concentrations but still at level which is unlikely to significantly adversely affect human health.

2. HEALTH IMPACTS - $PM_{2.5}$

2.1 Emissions of $PM_{2.5}$ from quarries is very low. The most relevant $PM_{2.5}$ data from the Yaldhurst quarry study for assessing the potential health impacts at Lehmans Road and West Belt was monitored at Site 2 which was 190m from the quarry boundary. The second set of relevant data is from the background site (4.8 km from the Yaldhurst quarry).

2.2 MfE recently consulted on proposed amendments to the National Environmental Standards for Air Quality (NESAQ) which include legislating a daily average $PM_{2.5}$ standard of 25 µg/m³, and an annual average $PM_{2.5}$ standard of 10 µg/m³. These proposed amendments have not yet been finalised but provide useful assessment health impact criteria for this review.

2.3 A comparison of the monitored daily average values of $PM_{2.5}$ with the proposed $PM_{2.5}$ NESAQ values show that all of the daily average values reported for $PM_{2.5}$ at Site 2 and the background site for the entire monitoring period were below 15 µg/m³ which is well below the proposed standard of 25 µg/m³ as a daily average. This indicates that the $PM_{2.5}$ levels were below proposed exposure standards (which have been set to protect human health) on all days (including dry days) during the monitoring period.

2.4 A comparison of $PM_{2.5}$ and PM_{10} data showed that the $PM_{2.5}$ component of PM_{10} concentrations at the two monitoring sites close to the quarries was on average 15%, but 24% at the background site. The report concludes that this suggests that the sources contributing to PM_{10} in the vicinity of the Yaldhurst quarry differ to those contributing to the PM_{10} measured at the background location. PDP understands that the background location was situated on a block of land between approximately 175m and 1.6 km from a main state highway. This may offer partial explanation for the higher

proportion of $PM_{2.5}$ recorded at the background site (24%) when compared to the monitoring sites (17% and 14%) as $PM_{2.5}$ is commonly associated with combustion sources including vehicles.

2.5 The key message and learnings from the monitoring data is that the PM_{10} discharged from quarries of a similar nature to the proposed Taggart quarry contains a relatively low proportion of $PM_{2.5}$.

3. RESPIRABLE CRYSTALLINE SILICA (RCS)

3.1 In the Yaldhurst study three months of monitoring for RCS was conducted at six locations (five test sites and one background site), with two months of monitoring at an additional background location (a total of 20 samples over seven sites) (Mote, 2018). The sampling method exclusively sampled particles with a diameter of 4 µm or less (PM_4). Only two sample filters were above the RCS detection limit with both detections of RCS occurring at site 3, which was 50m from the south-east boundary of the quarries monitored. The average RCS concentration at site 3 for the three-month period 19 January – 21 April 2018 was reported as 0.4 µg/m³. The chronic reference exposure level (REL) for RCS as stated by the Californian Office of Environmental Health Hazard Assessment (OEHHA) is 3 µg/m³ as an annual average. The reference table notes that chronic RELs are designed to address continuous exposures for up to a lifetime using the exposure metric of average annual exposure.

3.2 The results show that, at the highest impacted monitoring site over a period of three months during the potentially dustiest part of the year, the monitored RSC concentration was approximately 13% of the annual ambient guideline. Should the monitoring have continued for a full year, it is anticipated that the annual average concentration would be well below 0.4 µg/m³ (13% of the annual ambient guideline).

3.3 Given the scale of the Yaldhurst (relatively large) and Taggart (relatively small) quarries and that there will be no crushing occurring at the Taggart quarry, it is my opinion that the Yaldhurst RSC result can be used as a very conservative proxy for the concentrations of RCS that may be experienced in the receiving environment of the proposed Taggart quarry. Therefore, I conclude that concentrations of RCS around the proposed quarry, even at the boundary, will

be significantly lower than 10% of the health assessment guideline.

APPENDIX 2: DRAFT AIR QUALITY MANAGEMENT PLAN

1. The content and purpose of the AQMP;

The purpose of the AQMP is to provide a framework for the quarry operations and site personnel, in particular to:

- facilitate the avoidance, remediation, and mitigation of any adverse effects of discharges of dust generated from the extraction of material and associated processing activities undertaken at the site;
- promote proactive solutions to the control of dust discharges from the site; and
- ensure the effective and targeted use of available dust suppression water so that adverse effects of dust discharges are mitigated without exceedance of the water take limit.

2. A description of the dust sources on site;

For example earth moving, bund construction, enabling works, haul roads, extraction, stockpiling and transport. More detail of these dust source are currently provided in the AEE.

3. A description of the receiving environment and identification of sensitive receptors within 250 metres of site boundaries;

Will also include a map locating all the sensitive receptors within 250 metres of the site boundary.

4. The methods (including dust reduction through design methodologies) to be used for controlling dust at each source during quarry activities;

As detailed in the AEE.

5. A description of site rehabilitation methodology;

This will include details such as cleanfill acceptance criteria, stockpile on cleanfill, hydroseeding or vegetating final contoured areas.

6. A description of dust monitoring requirements, trigger levels and methodology;

Continuous Dust Monitoring

The continuous dust (TSP) monitors will be located on the eastern and western boundary, on the basis this area is expected to be subjected to the greatest impact of dust. The number and location of the dust monitors will be reviewed annually.

To ensure that dust mitigation measures are effective and to minimise the risk of any dust impacts beyond the boundary being offensive or objectionable, the site will adopt TSP monitoring trigger limits. A trigger limit is a concentration above

which either additional dust mitigation will be implemented, or quarrying activities ceased based on the following TSP monitoring trigger limits:

- Trigger Level 1 – (80 µg/m³ as a 1-hour average) – To identify that dust concentrations have reached a point where dust nuisance is likely to occur if action is not taken to implement mitigation measures. It would not be expected that concentrations would reach this level unless there are adverse weather conditions in conjunction with a failure of mitigation.
- Trigger Level 2 – (160 µg/m³ as a 1-hour average or 60 µg/m³ as a rolling 24 hour average) – If this trigger is exceeded it indicates that all dust concentrations have reached a level which is unacceptable, and dust nuisance will occur. All activities that have the potential to generate dust on site, apart from dust mitigation, must cease until such a time as dust concentrations drop below Trigger Level 1.

Alerts will be sent to the Site Manager by text and email, where a visual assessment can then be made and appropriate action taken.

Visual Dust Monitoring

Visual monitoring of dust will be undertaken to assess the level of dust emissions on the site and beyond its boundary. The visual monitoring will:

- Identity source(s) of dust (e.g. from heavy machinery, stockpiles, earthworks, etc.);
- Identify any areas of deposited dust from the site on surrounding roads and properties;
- Assess extent and direction of any dust plumes (e.g. within boundary, cross-boundary, or covering a large extent);
- Identify receptors potentially impacted by the plume (e.g. properties downwind to the northeast);
- Assess offensiveness – high, medium, or low; and
- Assess overall impact – high, medium, or low.

Onsite staff will continuously visually monitor to identify dust events. The Site Manager or delegate shall undertake a site walkover and visual dust monitoring at least once per day, in the early afternoon, to assess the overall effectiveness of the AQMP and assess compliance with the requirements of the resource consent conditions.

Site observations will be recorded in a daily log form which will be kept for at least 3 years.

Recording relevant inspection results, as well as the conditions of external and internal factors on the log forms, will help to assess if control measures are effective and to define appropriate corrective or preventative actions in case any adverse effects occur.

Meteorological Monitoring

Monitoring of weather forecasts will be undertaken daily and used to inform the potential need for additional mitigation measures (e.g. in the event that strong winds are forecast).

Before the daily briefing meeting, the Site Manager will obtain the weather forecast for the day and identify whether high dust risk conditions may occur. If high dust risk conditions are forecast, the Site Manager will highlight this to other on-site staff and instruct whether any additional dust mitigation is to be implemented for that day.

The forecast occurrence of high dust risk conditions shall be noted in the daily log along with any outcomes from the daily briefing meeting.

The site will have its own meteorological station which measures wind speed, wind direction, and rainfall. The meteorological site telemeters data in real time and has an inbuilt alert system which sends text and email messages to the key staff members. The alert system will be set up to provide warnings when medium and high-risk dust conditions occur to enable additional dust mitigation measures to be put in place as required. The table below shows a summary of the meteorological conditions contributing to different dust risk levels, the associated notifications, and required responses.

Dust Risk Levels, Meteorological Conditions and Responses				
Dust Risk Level	**Wind Speed**	**Wind Direction (blowing from)**	**Notification**	**Response**
Low	< 5 m/s	All directions	-	-
Medium	5 – 7 m/s		Text & email	Prepare for mitigation actions, visual inspection of dust discharges and implement water application for dust suppression if required
High	≥ 7 m/s		Text & email	Operators to visually identify potentially sensitive receptors in downwind direction and to use Tier 1 & Tier 2 dust mitigation measures as appropriate

Frequency of Monitoring

The table below outlines the frequency of the activities undertaken as part of the monitoring programme.

Monitoring Programme Activities and Frequency	
Monitoring Activities	**Frequency**
Check weather forecasts for strong winds and rainfall to plan appropriate activities and dust management response (7-day forecasts also available on www.metvuw.com and www.metservice.com).	Daily and as conditions change
Visual dust monitoring early afternoon site walkover.	Daily
Inspect site access and egress points to ensure dust is being contained to within the site.	Daily
Daily log form for visual monitoring of dust.	Daily.
Inspect watering systems (water carts and any other spray system) to ensure equipment is maintained and functioning to effectively dampen exposed areas.	Weekly
Inspect dust generating activities to ensure dust emissions are effectively controlled.	Ongoing
Monitor dust generating activities and water application rate.	In winds over 7m/s.

7. Reporting of Monitoring Programme

The following information will be recorded in a daily log or equivalent system:

- Results of the daily site inspections of visible dust emissions;
- Likely source(s) of any observations of dust;
- General weather conditions during the day (i.e., windy, calm, warm, rain etc.);
- The frequency of use of the water cart;
- Dust control equipment malfunctions and any remedial action(s) taken;

- Any unusual on-site activities; and
- Records of any complaints or other community feedback regarding the quarry activities.
- Continuous TSP and Meteorological data.

The log forms will be collated and stored on site and will be made available to ECan staff upon request.

8. **A description of procedures for responding to dust and wind condition-based trigger levels and associated follow up investigations and recording of findings;**

As per the above

9. **A system for training employees and contractors to make them aware of the requirements of the AQMP;**

Successful dust management depends on appropriate actions by site personnel in day-to-day operations of the site. Environmental training for all staff will be undertaken as part of the site induction programme. The environmental induction will include the following information specific to this AQMP:

- Information about the activities that may cause dust discharges within the site with the potential to impact neighbouring areas;
- Consent requirements;
- Dust mitigation procedures;
- Description of dust and meteorological monitoring for the site; and
- Complaints management procedures.

Staff training records will be maintained on site. The records will include:

- Who was trained;
- When the person was trained; and
- General description of training content and whether follow up/refresher courses are required at a later date.

10. **Names and contact details of staff responsible for implementing and reviewing the AQMP;**

The Site Manager will have day-to-day responsibility for the implementation of the AQMP. The Site Manager will have the following responsibilities in respect of the management of dust. They shall ensure

- That the conditions of all relevant resource consents are complied with at all times;

- That the dust control and mitigation measures and procedures outlined in the AQMP are implemented effectively;
- That there are adequate personnel and equipment on site at all times to enable the prescribed dust control;
- That the meteorological and dust monitoring programmes are carried out as required, including recording of daily observations;
- That any complaints received are investigated and resolved as far as practicable; and
- That all records are kept and are available to the relevant regulatory authorities.

All personnel working on the Project have responsibility for following the requirements of the air discharge consent conditions and the AQMP and reporting to the Site Manager on these issues.

11. Procedures, processes and methods for managing dust when staff are not on site;

Possible option available is to dampen down surfaces at the end of every day during dry conditions, using the dust monitors and met stations onsite to send alarms to on call staff, or having sprinklers set up to operate based on triggers from the dust and met station monitors. On call staff who reside in Rangiora can be deployed within short timeframes onsite for further mitigation additional to the automated dust suppressant systems.

12. Methods for determining the weather conditions that will trigger a restriction on potentially dusty activities;

High risk conditions are likely to include windspeeds above 7m/s blowing from the NW or East. Specific wind speeds and directions will be determined from the on-site monitoring data.

13. A method for recording and responding to complaints from the public;

It is important to ensure that any complaints are recorded and promptly investigated to identify and resolve the cause of the complaint. Requirements and procedures for complaints are detailed below.

The Site Manager has the responsibility to respond to and follow up all complaints regarding dust, and to ensure that suitable trained personnel are available to respond to complaints at all times.

Actions to be taken as soon as possible, following the receipt of a complaint, by the Site Manager include:

- Undertake a site inspection. Note all dust-producing activities taking place and the mitigation methods being used, take photographs for reference as appropriate. If the complaint was related to an event in the recent past, where possible, note any dust-producing activities taking place at that time;
- Initiate any remedial action necessary, which may include a stop work period;
- Note the time and date of the complaint/s and (unless the complainant refuses to provide them) the identity and contact details of the complainant. Ask the complainant to describe the discharge:
- Is it constant or intermittent?
- How long has it been going on for?
- Is it worse at any time of day?
- Does it come from an identifiable source?
- Meteorological data from the on-site station shall be downloaded;
- Note if the complaint has been referred to the ECan;
- As soon as possible (within 1 hour, where practicable), visit the area from where the complaint originated to ascertain if dust is still a problem;
- If it becomes apparent that there may be a source of dust other than the quarry activities causing the complaint, it is important to verify this. Photograph the source and emissions;
- As soon as possible after initial investigations have been completed, contact the complainant to explain any problems found and remedial actions taken. Initiate a damage assessment if required; and
- If necessary, update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.

Response Procedure

Following the receipt of the complaint, the following actions will be undertaken:

- Fill out the appropriate complaint form;
- Advise the Site Manager and the ECan within 48 hours that a complaint has been received, what the findings of the investigation were, and any remedial action taken;
- Advise site personnel as soon as is practicable that a complaint has been received, what the findings of the investigation were, and any remedial action taken; and
- Call or visit the complainant to update them on the actions taken and to check that the issue has been resolved.

14. A maintenance schedule for meteorological and particulate (including PM10) monitoring instruments;

Maintenance of the meteorological and particulate monitors will be undertaken in accordance with the manufactures specifications. This will be determined once the monitoring equipment as been selected.

15. **Separate Standard Operating Procedures (SOPs) dedicated to the management of potential dust discharges from specific sources, including but not limited to:**

    i. Stockpiles;

    ii. Site roads – sealed and unsealed;

    iii. Aggregate excavation and backfilling areas;

    iv. Top soil and overburden stripping and stockpiling;

    v. Bund construction and the recontouring of slopes during rehabilitation;

    vi. The automated dust suppression for dust prone areas that can be activated outside of working hours;

    vii. Location and calibration of PM_{10} and meteorological monitoring equipment.