BEFORE THE DECISION MAKERS APPOINTED BY THE CANTERBURY REGIONAL COUNCIL AND CHRISTCHURCH CITY COUNCIL

IN THE MATTER OF	The Resource Mangement Act 1991 ("RMA")
AND	
IN THE MATTER OF	Resource consent applications CRC193563, CRC193564, CRC193773 and RMA 2019 373 by SOL Quarries Limited for a discharge permit to discharge contaminants to air

STATEMENT OF EVIDENCE OF JEFFREY GEORGE BLUETT ON BEHALF OF SOL QUARRIES LIMITED

AIR QUALITY

1. INTRODUCTION

1.1 My name is Jeffrey George 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 management.

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 Previously I have worked as investigating officer for Canterbury Regional Council processing resource consent applications (1997-2000), leader of the air quality team and research scientist at the National Institute of

Water and Atmospheric Research (2000-2012), and Team Leader Air Quality at Golder Associates (New Zealand) Limited (2012-2018).

1.5 I have authored, or co-authored, approximately 150 reports and peer reviewed papers in aspects of transport, industrial, domestic and agricultural emissions to air. In relation to monitoring and assessing the impacts of dust, my recent projects have included:

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

(ii) Monitoring dust discharged from a coal stockyard and coal mine haul road;

(iii) Monitoring and assessing the impact of fibres discharged from a fibre board plant in Canterbury;

(iv) Assessing the impacts of dust discharged from two large and adjacent North Island limestone quarries;

(v) Stakeholder contribution to the development of the Ministry for the Environment's Good Practice Guide for assessing and managing dust;

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

(vii) Technical lead the construction dust section of the Clean Air Society of Australia and New Zealand's Good Practice Guide for the Assessment and Management of Air Pollution from Road Transport Projects.

Involvement in the Proposal

1.6 PDP was commissioned by SOL Quarries Limited (SOL) to review the Assessment of Air Quality Effects, SOL Quarries – Yaldhurst Expansion, NZAir, 12 February 2019 which had been submitted to Canterbury Regional Council (CRC) to support the application to expand the quarry. CRC had engaged Tonkin and Taylor (T+T) to audit the NZAir report and had made a request for further information by way of a Section 92 request.

SOL commissioned PDP to provide responses to the questions by CRC and Christchurch City Council (CCC)[1]. The T+T review of PDP report highlighted a number of further issues which were addressed in a second report by PDP[2].

1.7 To become familiar with the site, quarry operation and surroundings, a site visit was undertaken on the 9th of May 2019 hosted by the former SOL General Manager, Simon Hedley, now of Elrick and Co. I visited the site again on the 3rd of November 2020 to refresh my understanding of the site, processes, receiving environment and to inspect the particulate monitor installation.

Code of Conduct

1.8 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Scope of Evidence

1.9 My evidence will address the following:

(a) Onsite air quality monitoring;

(b) Water availability for dust suppression;

(c) Canterbury Regional Council's S42A report;

(d) The submissions made on the notification of this application;

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[1] Request for further information - CRC184072; CRC184073; RMA/2019/373. Pattle Delamore Partners Limited. 12 June 2019.

[2] Clarification of matters raised in Tonkin and Taylor's review of PDP's request for further information response - CRC184072; CRC184073; RMA/2019/373. Pattle Delamore Partners Limited. 15 August 2019.

(e) Proposed consent conditions; and

(f) Conclusions.

2. ON-SITE DUST MONITORING

Installation

2.1 In early February 2020 SOL had a real-time dust monitor installed on site. The monitor is an Aeroqual Dust Sentry 1.3 (Figure 1 Appendix A). The monitor is installed on the eastern boundary of the proposed quarry extension (Figure 2 Appendix A). The location was chosen to put the monitor in line between the current quarry and the sensitive receptors on Conservators Road. I understand the location of the monitor was discussed with and agreed to by CRC. The location of the monitor means that dust will be carried from the quarry toward the monitor when winds blow from the southwest.

Data Limitations

2.2 Before presenting a summary of findings from the dust data, I must highlight a number of limitations to the data that has been collected.

2.3 Since install there have been a number of problems with the monitor including a faulty power supply and a faulty pump. These problems have limited the amount of data collected to almost four months (109 days). The periods captured and used for this evidence were:

(a) 4 to 13 February 2020;

(b) 5 to 22 March 2020;

(c) 27 May to 23 June 2020; and

(d) 23 September to 5 November 2020.

2.4 The monitor is a light scattering nephelometer which is not compliant with the requirements of the National Environmental Standard – Air Quality (NESAQ). Using NESAQ compliant PM_{10} monitors for monitoring and managing dust at quarries is not common practice. This is because of the relatively high cost of the equipment, the infrastructure required for the monitor and relatively high operating costs. In addition to this, the response time of the NESAQ compliant monitors is much slower (1-hour,

compared to 1 minute. However, SOL's light scattering nephelometer does meet CRC's requirements for monitoring dust at the boundaries of quarries. Nephelometers are very good at providing relative dust concentrations at a fine time scale and are therefore a useful tool when it comes to identifying relatively high concentrations of dust and providing flags for when increased mitigation is required. However, nephelometers are limited in their ability to provide good quality absolute values of dust concentrations – therefore the data cannot be compared directly to the NESAQ. To provide indicative absolute concentrations a correction factor is often applied to nephelometer data. In my experience nephelometers tend to over measure dust concentrations and the correction factor is frequently less than one. The correction factor used in the Yaldhurst quarry air quality monitoring study[3] was 0.81.

2.5 The SOL nephelometer is fitted with an inlet head that measures total suspended particulate (TSP) which generally captures all particles with a diameter of 30 micrometres or less. TSP includes PM_{10} (particulate matter with a diameter of less than 10 micrometres).

2.6 The solar panels which provide power for the monitor are located adjacent and to the west of the monitor and may impact dust measurements coming from that direction.

2.7 The onsite meteorological mast was damaged by cattle in 2020 and for my analysis I have used meteorological data from Christchurch airport.

2.8 Despite the limitations of this data, in my opinion it still provides a very useful indicative and conservative indicator of the current air quality impacts of the existing SOL quarry at the boundary of the proposed quarry extension.

Monitoring Results

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

2.9 To control for the impact of rainfall on the dust data I removed hourly data when there was 1 mm or more of rainfall in that hour, from the 1-hour average analysis.

2.10 The wind rose for the hours included in the analysis (Figure 3 Appendix A) shows that the monitor was downwind of the quarry for approximately 25 percent of time (total of approximately 600 hours).

2.11 To consider the impact of wind direction on TSP concentrations I produced a scatter plot of 1-hour average TSP concentrations against wind direction (Figure 4 Appendix A). The wind arc within which the monitoring site is down wind of the quarry is approximately 210^{o}N to 270^{o}N. The key features of the scatter plot are:

(a) The vast majority of 1-hour average TSP concentrations are below 10 $\mu g/m^3$;

(b) There are a relatively small number of 1-hour average TSP concentrations are between 10 and 20 $\mu g/m^3$;

(c) The highest 1-hour average TSP concentrations is approximately 24 $\mu g/m^3$;

(d) All TSP concentrations are well below the proposed additional mitigation and stop work trigger levels;

(e) The TSP concentrations are slightly lower with the wind arc of from about 270 through to 60^{o}N;

(f) The lack of winds from the south-east quarter is obvious; and

(g) The TSP concentrations are slightly higher with the wind arcs of about 60 through to 90^{o}N and 180 through to 260^{o}N (from the direction of the SOL quarry.

2.12 To further consider the impact of wind direction on TSP concentrations I produced a pollution rose normalised by wind direction (Figure 5 Appendix A). The key features of the pollution rose are:

(a) TSP concentrations below 5 $\mu g/m^3$ are the most frequent experienced from all wind directions;

(b) The highest TSP concentrations come from the north and south-south-west direction (the direction of the SOL quarry) although any values above 15 $\mu g/m^3$ are very infrequent;

(c) The lowest TSP concentrations are recorded with the west-north-west and east-south-east wind directions;

(d) The frequency of TSP concentrations of between 5 and 15 $\mu g/m^3$ are a little more frequent from the south-south-west (the direction of the SOL quarry) but similar for all other directions; and

(e) TSP concentrations are at zero for approximately 1.7 % of the time.

2.13 I have also considered the 24-hour average concentrations of TSP (Figure 6 Appendix A) to give an indicative assessment of potential health impacts of particulate occurring at the monitoring site. It is important to note that the site measures TSP, while the NESAQ is for PM_{10}. However, TSP includes PM_{10}, so if the monitor were measuring PM_{10} concentrations these would be lower that the measured TSP concentrations. It is also important to note that the nephelometer data requires a correction factor to provide concentrations that are comparable to those measured by an NESAQ compliant monitoring method. As noted above (paragraph 2.4) in my experience the correction factor is generally less than one, meaning an uncorrected nephelometer concentration is likely to be higher than a concentration measured by an NESAQ compliant monitoring method. In summary, the concentrations of TSP measured at the site will provide an indicative but conservative estimate of PM_{10} concentrations.

2.14 The 24-hour average concentrations of TSP are all below 11 $\mu g/m^3$ with 70% of the days being below 5 $\mu g/m^3$. In my experience these concentrations are in line with those monitored at rural background sites, which do not have any significant close by sources of TSP.

Summary of Findings

2.15 The scatter plot and wind rose show that there may be a slight increase in TSP concentrations when the quarry is downwind of the monitoring site. However, in my opinion any increase observed is relatively small and concentrations are not close to trigger levels which would require work to stop work or require additional mitigation measures to be implemented.

2.16 The analysis of 24-hour average TSP concentrations suggests that PM_{10} concentrations are likely to be well below the NESAQ concentration of 50 mg/m^3 and therefore unlikely to produce any significant adverse health effects. This finding is based on site specific data and conservative assumptions. The findings of this qualitative assessment consistent with the qualitative conclusions provided in both PDP dust assessment reports.

3. WATER AVAILABILITY FOR DUST SUPPRESSION

3.1 One of the key concerns raised by Ms McClintock[4] in regards to this application is the reliance of SOL on the 104 m^3/day water take from the Paparua Water Race Scheme for dust suppression (paragraphs 74 to 77 and paragraphs 182 to 195 of Ms McClintock's evidence). Ms McClintock's evidence focuses on the uncertainty of the long-term availability of this water due to SOL's current short term (2-year agreement) with Selwyn District Council for access to this water, and the risk associated with renewing this agreement in the longer term.

3.2 In recent weeks SOL have gained access to an alternative water supply for dust suppression. SOL now propose to substitute the water take from the Paparua Water Race Scheme for the water extracted from an existing bore on the proposed quarry extension (M35/0947) consent number CRC203210. The consent allows for a maximum take of 3,283 m^3 in any 14 period of 110 m^3 per day for the purposes of irrigation, the same restriction as water from the Paparua Water Race Scheme.

[4] Section 42a Officer's Report, Rubie McClintock, Canterbury Regional Council. November 2020

3.3 Because the heavy-duty vehicle access road is now sealed the total volume of water required for dust suppression on the quarry site has been reduced by approximately 4.5 m^3. The alternative water source provides approximately 5 m^3/day more than the Paparua Water Race Scheme, so this means SOL have a volume of water available slightly in excess of their daily needs.

3.4 As a back up plan, SOL intend to follow through with the Paparua Water Race Scheme water take agreement with Selwyn District Council. These two measures will provide SOL security of supply of water in the short and long-term and should address Ms McClintock's concerns.

4. COMMENTS ON SECTION 42A REPORT AND TONKIN AND TAYLOR'S REVIEW OF SOL'S AIR QUALITY ASSESSMENT

4.1 The key findings of the Section 42A report rely heavily on the Tonkin and Taylor's review of the SOL air quality assessment. I consider the key findings of the Section 42A report are:

(a) The implementation of the consent conditions will ensure that the effects of the proposal on sites of ecological significance are no more than minor and are acceptable (paragraph 220 of Ms McClintock's Evidence);

(b) The proposal is consistent with good practice and, provided the applicant has sufficient water, it is likely that the proposed activity will be able to mitigate effects appropriately. If mitigation is available at all times and diligently implemented, it is likely that effects on the surrounding residences will be less than minor (paragraph 228 of Ms McClintock's Evidence);

(c) The concentrations of respirable crystalline silica (RSC), PM_{10} and $PM_{2.5}$ are likely to be within relevant human health-based guidelines and standards and therefore are likely to be less than minor (paragraph 229 of Ms McClintock's Evidence); and

(d) Provided the applicant ensures that there is no more than nine hectares of quarry, the large separation distances to other quarries will ensure that no adverse cumulative effects occur (paragraph 235 of Ms McClintock's Evidence).

4.2 These four key findings are consistent with the conclusions reached in the PDP assessment. I note that Ms McClintock has recommended a comprehensive set of consent conditions which aim to ensure that mitigation is available at all times and diligently implemented. I comment on the recommended consent conditions in Section 6 of my evidence.

4.3 In his evidence[5] Mr Chilton describes the relevance of the Harewood Gravels Environment Court decision (2017 NZEnvC 165) to the SOL application (paragraphs 19 to 23). The key points Mr Chilton raises from the decision are that identifying sensitive receptors and sources of dust in the locality is insufficient to:

(a) Establish the background level of dust; or

(b) Assess cumulative effects.

4.4 Mr Chilton and I agree that the use of the Yaldhurst dust data[6] is a robust method of establishing likely background dust levels at the SOL site. I have used the Yaldhurst dust concentrations, separation distances between the sensitive receptors and the SOL and other quarries, along with the mitigated emissions of dust from the proposed SOL quarry to inform an assessment of cumulative effects. Following this assessment and his review, Mr Chilton and I agree that the potential for any appreciable cumulative dust effects is low.

4.5 In addition to this, we now have some on-site dust data that supports the conclusions we drew on background concentrations using the Yaldhurst study. Therefore, it is my opinion we have robustly established the likely background levels of dust in and around the proposed SOL quarry, well beyond simply identifying sensitive receptors and sources of dust.

4.6 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

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[5] Addendum to Section 42A Officer's Report, Report of Richard Chilton.

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

quarry expansion is most likely to be normal or very close to normal for a rural environment.]

4.7 In summary, paragraphs 4.4 to 4.6 of my evidence address the two key issues of the Harewood Gravels Environment Court decision highlighted by Mr Chilton.

4.8 Mr Chilton expresses a reservation (paragraph 38 of his evidence) on the proposed mitigation measures by SOL where it is assumed that dust measurement concentrations alone will be used as triggers for implementation of water suppression through the use of watercarts or sprinklers. Mr Chilton considers it is good practice for water suppression to be used at the outset of operations on a dry day and then regularly throughout the day on frequently trafficked areas. I agree with Mr Chilton on this issue of good practice and recommend that this action be worked into the SOL site dust management plan.

5. SUBMISSIONS

5.1 I have reviewed the submissions made on this application and address the key issues raised by submitters in the following sections.

Health Impacts

5.2 The heath impacts of PM_{10}, $PM_{2.5}$ and Respirable Crystalline Silica were raised by a number of submitters. The following paragraphs present a summary of existing research and monitoring into emissions of $PM_{2.5}$ from quarries, with particular reference to the proportion of the $PM_{2.5}$ emissions that may contain to be respirable crystalline silica (RSC).

5.3 The closest sensitive receptor is located over 250 m from the boundary of the proposed quarry area (with the exception of the existing access road). The quarry's two crushing plants will not be located any closer than 350 m from the nearest property boundary (not owned by Environment Canterbury) resulting in a minimum separation distance of over 600 m between crushing activities and the property at 90 Conservators Road.

5.4 The Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Dust (2016) states that, at the time of writing, EPA Victoria (2013) has the most up-to-date guidance considered appropriate for New Zealand. The recommended EPA Victoria separation

distances to sensitive receptors such as dwellings for quarrying, crushing, screening, stockpiling, and conveying of rock are:

(a) Without blasting: 250 metres; and

(b) With blasting and/or RCS: 500 metres.

5.5 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:

(a) 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

(b) 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.

5.6 Yaldhurst represents a large area (230 ha) containing multiple quarries and a range of processing activities at a scale of more than 20 times the size of the proposed SOL Quarry extension (10 ha). The monitoring occurred over the months of December to April which tend to be windier and drier than other periods during the year. Although the period did include one three-day weather event that produced a relatively large amount of precipitation. An analysis of the meteorological data over the monitoring period indicated that there were 33 days with rain during the 120-day monitoring period. This indicates that there were 87 days without rain. Given this I consider that the results should give a good indication of the likely levels of RCS and particulate matter during high-risk (dry and windy) conditions.

5.7 The large size of the Yaldhurst quarry area means that the reported concentrations of RCS and particulate matter will provide a conservative estimate of those likely to be experienced at the proposed SOL quarry extension.

Respirable Crystalline Silica

5.8 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 50 metres 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.

5.9 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).

$PM_{2.5}$

5.10 $PM_{2.5}$ was monitored at two sites close (50-200m) to the Yaldhurst quarries and at the background site (4.8 km from the quarries) (Mote, 2018).

5.11 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 criteria for this review. A comparison of the monitored daily average values of $PM_{2.5}$ with the proposed $PM_{2.5}$ NESAQ values show that all values were below 10 µg/m³ for site 3 (50 m from the south-east boundary of the quarries). At the more distant sites, the vast majority of monitored $PM_{2.5}$ concentrations were below 10 µg/m³ but there were a few occurrences over the 120-day monitoring period during which concentrations were above 10 µg/m³ at site 2 (190 m to the north-east of the quarries) and site 4 (background – rural location approximately 4.8 km from Yaldhurst).

5.12 All of the daily average values reported for $PM_{2.5}$ from two monitoring sites and one 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.

5.13 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 quarries 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 175 m 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.

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

Summary of findings

5.15 I consider the reported concentrations of particulate matter and RCS in the Mote (2018) study to be a conservative indicator for concentrations that could be associated with the proposed SOL quarry extension.

5.16 The monitored concentrations of $PM_{2.5}$ and RCS at test sites between 50 m and 190 m from the boundary of the quarries reported by Mote (2018) suggest that the quarry contribution of these contaminants to overall concentrations of PM_{10}, $PM_{2.5}$, and RSC at a separation distance of 250 m or more from quarrying activities will be negligible and well below the respective health impact assessment criteria.

5.17 The property at 90 Conservators Road is located at a distance of over 250 m from the proposed SOL quarry extension boundary, and over 600 m from the location of the associated crushing plants. Due to the substantial

separation distance, it is expected that the proposed quarrying and associated activities will have a negligible contribution to $PM_{2.5}$ and RCS concentrations at this property.

5.18 I note that some submitters questioned the validity and usefulness of the Yaldhurst data for the assessment. I am of the same opinion as Mr Chilton in that the Yaldhurst data is robust and provides a useful insight into the likely concentrations of contaminants likely to be experienced in the area around the SOL site.

Cumulative Effects

5.19 A key issue for some submitters was the cumulative effects of dust if the SOL quarry expansion is granted. Given the background dust concentrations, separation distances between the sensitive receptors and the SOL and between other quarries, along with the mitigation of emissions of dust from the proposed SOL quarry, Mr Chilton and I reach the same conclusion, that the potential for any appreciable cumulative dust effects is low.

Effectiveness of Mitigation Measures and Loss of Amenity Value

5.20 Submitters have questioned the effectiveness of the proposed mitigation measures and the consequential loss of amenity values. In my experience the mitigation measures proposed by SOL align very well with accepted good practice and some measures are leading edge, for example the automated water spray system.

5.21 Ms McClintock concludes that if mitigation is available at all times and diligently implemented, it is likely that effects on the surrounding residences will be less than minor (paragraph 228 of her evidence). To achieve this outcome, Ms McClintock has recommended a comprehensive set of conditions which will ensure that the mitigation is available and effective. These conditions are discussed in Section 6 of my evidence.

5.22 The real-time dust and wind monitoring, and warning systems will significantly increase SOL's ability to identify and respond to any adverse metrological conditions or dust event.

5.23 It is my opinion that the mitigation measures are appropriate and if effectively implemented, will result in any loss of amenity values being less than minor. .

Consent compliance

5.24 Several submitters expressed concerns regarding SOL's non-compliance with consent conditions. I note that in the SOL Quarry Compliance History[7] a total of five formal inspections have been made over the period from July 2018 to August 2020. One non-compliance issue was noted in July 2018 where speed limits on haul roads were not being complied with.

6. RECOMMENDED CONDITIONS OF CONSENT

6.1 Appendix 6 of Ms McClintock's evidence provides recommended conditions for CRC193564 to discharge contaminants to air. I have reviewed the recommended conditions and I am in general agreement with the majority of conditions. I discuss some minor points on the recommended conditions below. My points highlight conditions which I support but to date have not discussed in any detail. My points also highlight the conditions for which I suggest amendments. The condition numbers are taken as defined in Appendix 6 of Ms McClintock's evidence.

6.2 Condition 14 and Condition 15 require the development of, and define, the content of a site dust management plan (DMP). I support these conditions but suggest that the DMP may be incorporated into the wider Quarry Management Plan.

6.3 Condition 18e) requires regularly vacuum sweeping of unsealed roads and yard areas. This condition is impractical and may create more dust than it removes by disturbing unsealed surfaces. I recommend this condition is deleted.

6.4 Condition 19a) requires all stockpiles shall be dampened with water. This condition is impractical for SOL as they suggest dampening of stockpiles can lower the quality of product. I recommend that condition 19a) be

[7] SOL Quarry Compliance History, Mary Mortiaux (CRC Resource Management Technical Lead) 30 October 2020.

amended to "*Any all stockpiles emitting significant amounts of dust be dampened with water*".

6.5 Condition 21 requires that SOL cease quarry activities when water is not available from the Paparua water race. Now that the Paparua water race is no longer the proposed primary source for the irrigation portion of the dust mitigation water, I recommend this condition be deleted.

6.6 Condition 22 requires an anemometer to be installed on 10 m high mast. SOL have a mast installed on site but they will need to replace the mast's anemometer. I understand that SOL also plan to install wind direction and speed sensors at the dust monitoring site.

6.7 Condition 24 requires the dust monitor to measure PM_{10} – currently it has a TSP head. This can easily be changed at a cost of about $600.

6.8 Condition 24b) requires that the dust monitor be located to comply with the requirements of AS/NZS 3580.1.1:2006 (Guide to siting air monitoring equipment). In my opinion, with the solar panels being at the same height and within 5 m of the monitor, this site is currently unlikely to comply with AS/NZS 3580.1.1:2006. Shifting the solar panels (or monitor) by approximately 10 m is required for the site to compile with the standard.

6.9 Conditions 28 to 30 define the wind and PM_{10} trigger values for stop and start work conditions. I note and agree Mr Chilton's suggestion about keeping some flexibility on the dust and wind speed trigger limits used to flag the need for additional mitigation or stop and start work (paragraph 41 of his evidence). I recommend these conditions be amended to require the DMP to include a process to set and review the trigger levels.

6.10 Condition 32 defines the wind speed trigger values to activate the automated sprinkler system outside of working hours. I recommend this condition be amended to require the DMP to include a process to set and review the trigger levels for the operation of the automated sprinkler system.

7. SUMMARY

7.1 A summary of the key findings from my evidence are:

(a) Onsite air quality monitoring has been undertaken on the SOL quarry site. The monitoring programme has provided evidence to

support the conclusions that the impact of particulate discharged from the proposed quarry expansion will be less than minor.

(b) An alternative water source has been found to the Paparua Water Race Scheme which will provide the 110 m^3 per day for the irrigation portion of dust mitigation water supply. The ground water bore supply will address any concerns about security of supply of water for dust mitigation.

(c) The conclusions reached in the Canterbury Regional Council's S42A report on ecological, human health, amenity and cumulative effects align with those provided in SOL's AEE and find that any adverse effects are likely to be less than minor.

(d) A number of key issues have been identified from the submissions made on the notification of this application. Each of these issues has been considered by myself and by Mr Chilton and we have both concluded that the relevant issues can be addressed by an effective dust mitigation and monitoring plan.

(e) The CRC and I agree that if mitigation is available at all times and diligently implemented, it is likely that effects on the surrounding residences will be less than minor. To achieve this outcome, CRC has recommended a comprehensive set of conditions. I have reviewed the recommended conditions and I am in general agreement with the majority of conditions. I have suggested some minor amendments to make the conditions practical to implement and monitor.

Jeffrey George Bluett

20 November 2020

APPENDIX A: FIGURES

FIGURE 1: Air Quality monitoring equipment at SOL quarry looking nor-west.

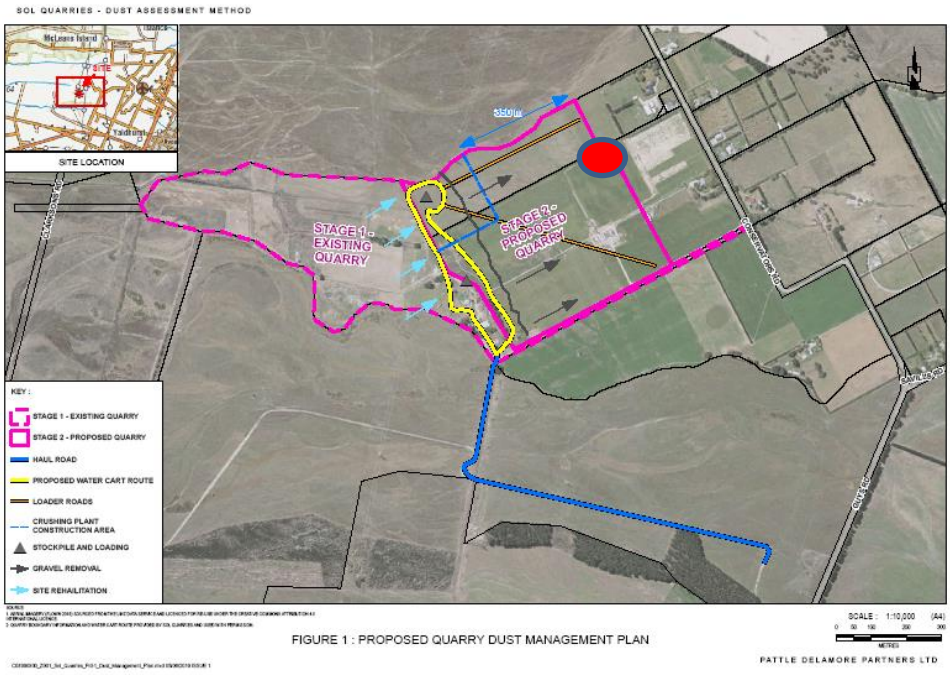

FIGURE 2: Location of Air Quality monitoring site at SOL quarry indicated by the red circle

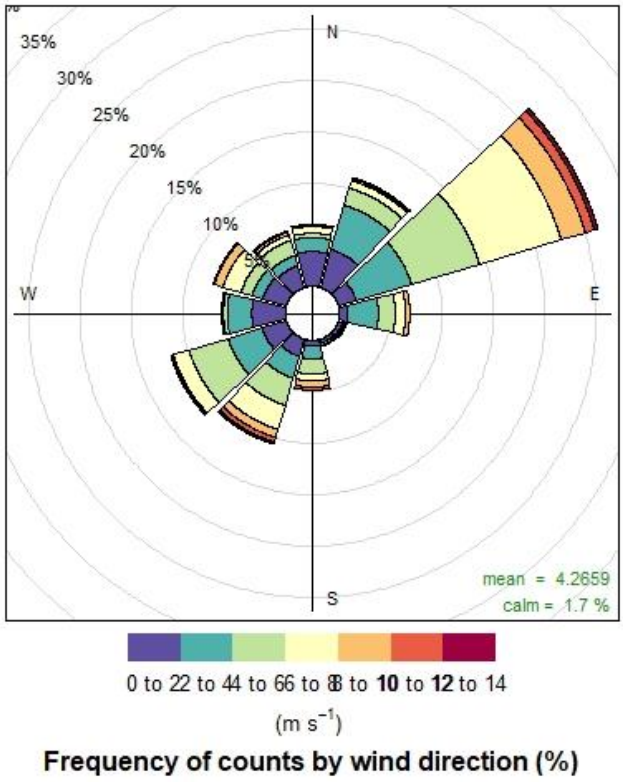

FIGURE 3: Wind rose for the hours included in the analysis (data from Christchurch airport)

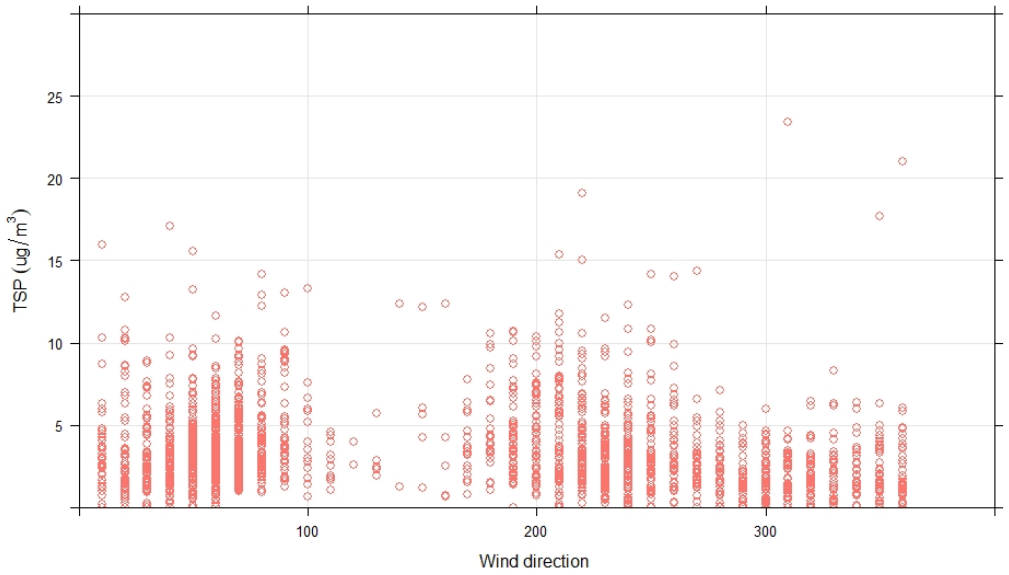

FIGURE 4: Scatter plot of 1-hour average TSP concentrations against wind direction

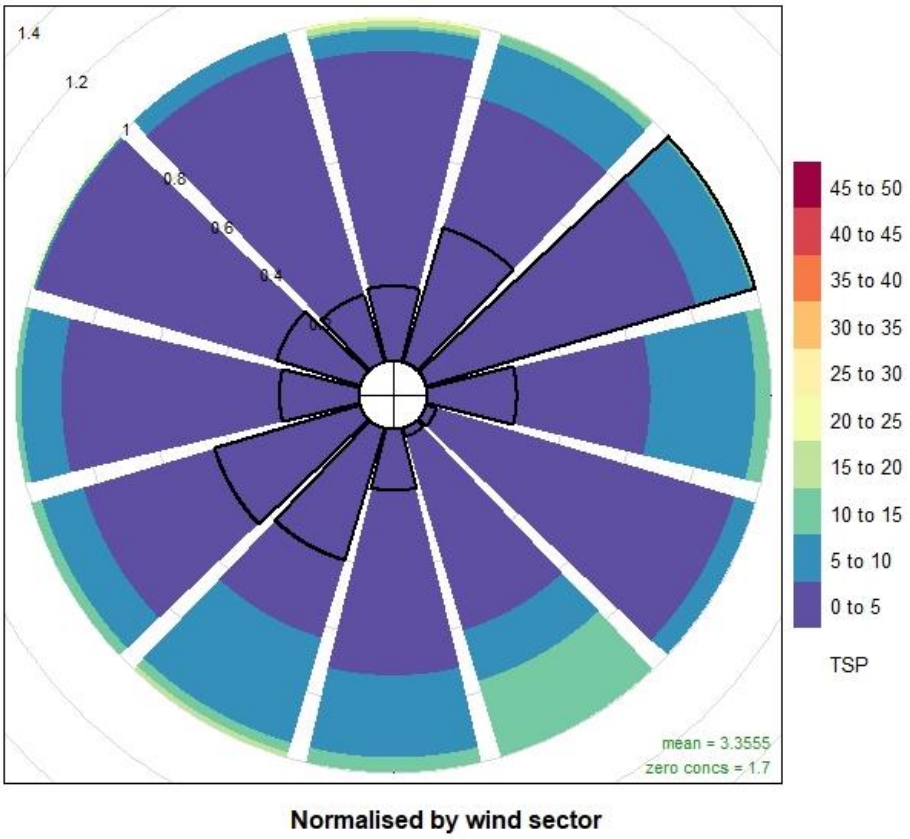

FIGURE 5: Pollution rose normalised by wind direction.

Note the back lined inner petals indicate the relative frequency of winds from that direction.

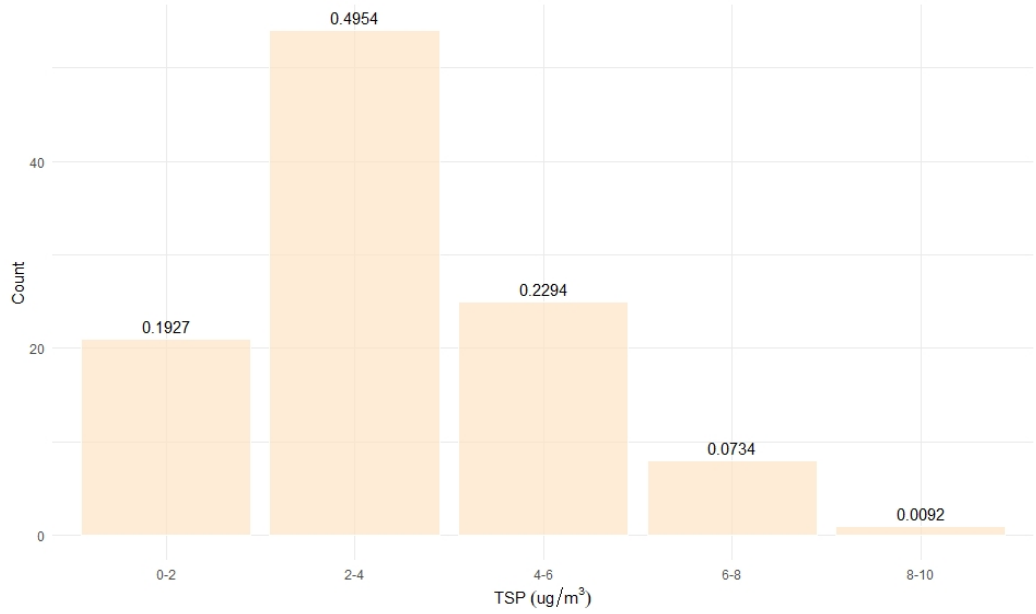

FIGURE 6. 24-hour average concentrations of TSP