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5 March 2021

Landpro Reference: 19474
Council Reference: RM20.360/A1434855

Otago Regional Council
70 Strafford Street
Private Bag 1954
Dunedin, 9054

Dear Sarah Davidson

Re: Request for Further Information under Section 92(1) of the Resource Management Act 1991 –

Application for the expansion of the Amisfield Quarry

In reference to your request for further information dated 21 January 2021, please find attached as Appendix 1 the requested information.

Kind Regards,

Matt Curran

Senior Planner

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Appendix 1: RM20.360.03 Amisfield Quarry Response to Request for Further Information

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1 March 2021

Attention: Matt Curran

Dear Matt

RM20.360.03 Amisfield Quarry Response to Request for Further Information

1 Introduction

Otago Regional Council (ORC) has requested further information under Section 92 of the Resource Management Act (RMA) (s92 Request) regarding an application to discharge contaminants to air made by Cromwell Certified Concrete Limited (CCC) for the Amisfield Quarry near Cromwell.

Beca was commissioned by Landpro to prepare a technical assessment report of the potential effects of dust from the Amisfield Quarry titled "*Amisfield Quarry – Technical Assessment of Potential Effects of Dust Discharges", October 2020 (*Beca Report) which was used by Landpro to support an application for resource consent.

Beca has now been commissioned by Landpro to provide a response to the questions raised in the request for further information made by ORC. The questions are addressed below.

2 Question 1

Please supply a detailed Dust Management Plan (DMP). The DMP must identify mitigation measures to avoid, mitigate and remedy adverse dust effects and specify how these measures will be implemented.

A draft Air Quality Management Plan for the site has been prepared and is attached to this letter (**Attachment A**). Note that the AQMP will be finalised following receipt of the new consent.

3 Question 2

Please provide a detailed assessment on potential adverse effects of dust discharges and associated deposited dust on adjacent cropping activities, including cumulative effects. The assessment must also identify measures to avoid mitigate and remedy such effects.

3.1 Overview of Effects

The cherry orchard along Amisfield Road (as shown in Figure 1) is located on Lot 2 DP 508108 approximately 100m to the south of the existing quarry site (at its closest point) and approximately 300m to the south of the proposed expansion area. A cherry orchard is also located on Lot 1 DP 508108 between 40-70m to the east of the proposed expansion area on a lower river terrace.

The vineyards to the west of the Luggate/Cromwell Road are approximately 150m from the existing quarry and site entrance and at least 600m west of the proposed expansion area.

The vineyards to the north of the site are approximately 20m west/northwest of the site (offices/yard area and main site entrance). These vineyards are approximately 300m west/northwest of the proposed expansion area.

There is also a vineyard located to the southwest of the existing quarry on the eastern side of Luggate Cromwell Road. At its closest point, the vineyard is approximately 35 m from the boundary of the quarry.

Figure 1 Aerial photograph showing the location of the quarry and the surrounding properties

While there are a number of studies that have investigated the effects of dust deposition on horticultural crop production and natural ecosystems, we are not aware of any specific national or international guidelines relating to the management of dust in regard to either cherries or grapes.

Excessive dust in the finer fractions has the potential to adversely affect crops and vegetation by interfering with plant photosynthesis, promoting weed or disease incidence and interfering with the efficacy of pesticide and fertiliser applications. Dust deposition can also make pasture less palatable to stock. The nature and degree of effects of dust deposition on plants is dependent on factors such as the chemical characteristics of the dust, the dust particle size and the species of plants.

The Amisfield quarry mineral aggregate (stone and sand) is relatively inert and therefore low in potentially toxic water-soluble chemicals. The deposition of any dust onto the leaves of crops is therefore unlikely to

result in significant chemical reactions that would be detrimental to plant health. The quarry dust does not contain material with a high pH (eg limestone or cement dusts) which could cause direct plant tissue damage. While the products of combustion (eg sulfur dioxide (SO_2), nitrogen oxides (NO_x) and carbon monoxide (CO)), will be also discharged in the emissions from the operation of site machinery and vehicles, these emissions are minor and will be well dispersed before reaching the site boundary. Therefore, these combustion products are not expected to have any adverse chemical effects on nearby crops.

A key physiological effect of excessive dust deposits on leaves is blockage of stomata especially on the upper surfaces. Stomata are small pores on the surfaces of leaves and stems, bounded by a pair of guard cells, that control the exchange of gases—most importantly water vapour and CO_2 - between the interior of the leaf and the atmosphere. Clogged stomata or guard cells can reduce the transpiration rate, increase canopy temperature, and then slowly restrict the plant growth, photosynthesis rate, and diffusive resistance mechanism.[1]

The stomatal diameters of most plants are usually in the range of 8-12 μm^2. Therefore, dust particle size is an important criterion for possible leaf penetration and particles with PM_{10} and smaller sizes can theoretically interfere with stomatal functions. It is noted that the dust generated from site quarrying activities is predominantly made up of larger size fractions (ie greater than 10 µm - 100 µm) which are larger than the diameters of most plant stomata - limiting the potential for clogging.

Farmer[3] showed that the direct physical effects of mineral dusts on vegetation (such as may be generated from aggregate quarrying) only becomes apparent at relatively high surface loads (ie >7g/m^2) compared with the chemical effects of reactive materials such as cement dust which can be evident at 2g/m^2.

While the quarry is a year-round operation, particular attention to mitigation of generation and transport of dust will be required during the higher risk months for horticulture between September and April in each year. It is expected that cherries will be more susceptible to excessive dust deposition during key periods from flowering (September), to harvest (late November to early February depending on varieties)[4].

Grapes grown for wine production are expected to be more vulnerable to excessive dust deposition during key periods from flowering in October to harvest in late April/early May depending on varieties and seasonal factors.

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[1] Kameswaran S et al (2019) *Dust Pollution and its Influence on Vegetation – A Critical Analysis;* Research Journal of Life Sciences, Bioinformatics, Pharmaceutical and Chemical Sciences DOI: 10.26479/2019. 0501.31

[2] Krajickova A and Mejstrik V. (1984) *The effect of fly-ash particles on the plugging of stomata.* Environmental Pollution. 36: 83-93

[3] Farmer A M (1993) *The effects of dusts on vegetation – a review*; Environmental Pollution 79, 63-75.

[4] Paterson, M (2003) *Cherries: An analysis of traditional and dwarf varieties and methods for Teviot Valley, Central Otago*; report prepared for Primary Industry Council/Kellogg Rural Leadership Programme.

3.2 Background dust levels

3.2.1 Overview

The rural area surrounding the Amisfield Quarry is naturally dry and dusty and other landuse activities will regularly generate dust that will also impact local orchards and vineyards. The MfE (GPG Dust)[5] describes typical background levels of deposited dust for different environments. Background dust levels are usually less than 1 gram per square metre per 30 days (g/m^2/30days), but there are some areas (particularly in dry rural environments) where levels can be up to 10 times that amount. Any dust effects on nearby horticulture from the Amisfield Quarry therefore needs to be assessed in this context. The large fluctuations in background rural dust levels are illustrated in the following paragraphs.

3.2.2 Examples from other similar operations

Dustfall data analysed by Beca, between May 2009 and May 2015, at nine sites in a rural area around an open cast goldmine at Earnscleugh in Central Otago, averaged 1.0 g/m^2/30 days but varied from near zero to 15.5 g/m^2/30 days. The land uses on the Earnscleugh Flats are characterised by orchards, vineyards and pastoral farms and mining activities were carried out relatively closely to these activities. The Earnscleugh area has a low rainfall and low average wind speeds which is very similar to the Amisfield Quarry site.

The goldmine consents included requirements for ongoing dust monitoring around the site while mining operations were carried out. These results are also relevant to the Amisfield quarry site as the aggregate material being excavated and the potentially dust generating activities are similar.

The results of the monitoring[6] at the goldmine demonstrate that the relatively large-scale excavation operation was able to operate consistently within the limits of the consent and mitigation measures effectively controlled dust emissions from impacting surrounding land uses including nearby orchards and vineyards. The mitigation methods used at the mine were similar to those that are used at the Amisfield Quarry.

The GPG Dust reports that background Total Suspended Particulate (TSP) levels in “clean” environments are about 10-20 micrograms per cubic metre ($\mu g/m^3$) but can greatly exceed this in summer in rural areas due to agricultural activities and natural dust erosion. The average background TSP concentration measured at Earnscleugh between May 2009 and May 2011 was 10 $\mu g/m^3$ but this varied from nearly zero to a maximum 24-hour average value of 96 $\mu g/m^3$ (Beca, 2014)[7].

Beca has also analysed the TSP concentrations in the vicinity of the Oceana Gold Macraes mine in Eastern Otago. The Macraes area is also dry but has higher average wind speeds than those measured in Central Otago. The average TSP concentration measured at a rural location at Macraes unaffected by mining

[5] Ministry for Environment (2016) *Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions*

[6] Beca Ltd (2014) *Earnscleugh Gold Mine- Air Quality Technical Report;* prepared for Mintago Investments Ltd

[7] Harwood P (2014) Evidence presented to Canterbury Regional Council and Christchurch City Council on behalf Frews Quarries Ltd in regard to an application for landuse consent and air discharge consent for operation of a gravel quarry

between 2000 and 2008, during summer months (December – March), was 14 µg/m^3 but concentrations reached values as high as 180 µg/m^3 (24-hour average) in dry windy conditions.

Regardless it is acknowledged that, in the absence of appropriate mitigation at the quarry, there is some risk that any dust generated under windy conditions will be added to existing dust levels in the area, with additional adverse effects on the health of nearby horticultural crops, from flowering to harvest with consequential losses to production and/or rejection and downgrading of fruit. In dry climates such as occurs around Cromwell, rainfall can be scarce with often limited natural washing of dust from leaves.

We understand that the adjacent orchards have bird nets over the trees – erected once they are old enough to harvest, but there is no overhead sprinkler system. Bird netting would be expected to provide an additional barrier and help reduce dust deposition from external sources.

3.3 Results from Monthly Windroses (September to April)

3.3.1 Overview

Monthly windroses (using winds >5m/s) have been prepared for the 8-month period September to April using the wind data from the Fulton Hogan weather station (see Section 5 and **Attachment B**). These months represent the period each year when cherries and grapes are most vulnerable to deposition of dust. The results from these windroses are summarised in Table 1.

Table 1 Summary of results from monthly windroses (September to April) wind data (winds >5m/s)

Month	Comments
September	Winds >5m/s occur predominantly from the northeast (~6% of time) with very little strong wind from other quarters.
October	Winds >5m/s predominantly from the northeast (~ 8% of time); winds from west and south east ~3% of time.
November	Winds >5m/s predominantly from northeast (6% of time) and south/southeast (~6.5% of time). Strongest winds from southeast; winds from west ~2.5% of time.
December	Winds >5m/s predominantly from northeast and south/southeast (~7% of time). Less frequently winds from west (~2% of time).
January	Winds >5m/s predominantly from northeast and south (~6% of time). Strongest from northeast. Less frequently winds from southeast (~4%) and southwest (~3%).
February	Winds >5m/s predominantly from northeast (~5% of time) and south (~4% of time). Strongest from northeast. Less frequent winds from southeast (~2% of time).
March	Winds >5m/s predominantly from south (~3% of time). Less frequent winds northeast and southeast (~2%).
April	Winds >5m/s predominantly from northeast (~3% of time). Less frequent winds (~2%) from south.

From these results, it can be seen that stronger winds (>5m/s) are predominantly from the northeast in the spring months. However, similarly stronger more frequent winds can also occur from the west and southeast during October and November.

Stronger northeasterly and southeasterly winds (>5m/s) continue to predominate over the summer months with less frequent, weaker winds from the west and south west in December and south in February. During March and April, the overall frequency of stronger winds reduces with the predominant direction remaining from the northeast, southeast and south.

There is a high frequency of low wind conditions (<5 m/s) over the 8-month period particularly during early spring (September/October) and Autumn (March/April).

The average wind speed measured over the monitoring period between September to April was 3.3m/s. The percentage of winds which exceed 5m/s, the critical windspeed for dust pickup from unconsolidated surfaces from all directions during these months is 18% and the percentage of strong winds exceeding 10m/s is 0.2%.

Figure 2 shows the September to April windrose for windspeeds greater than 5 m/s.

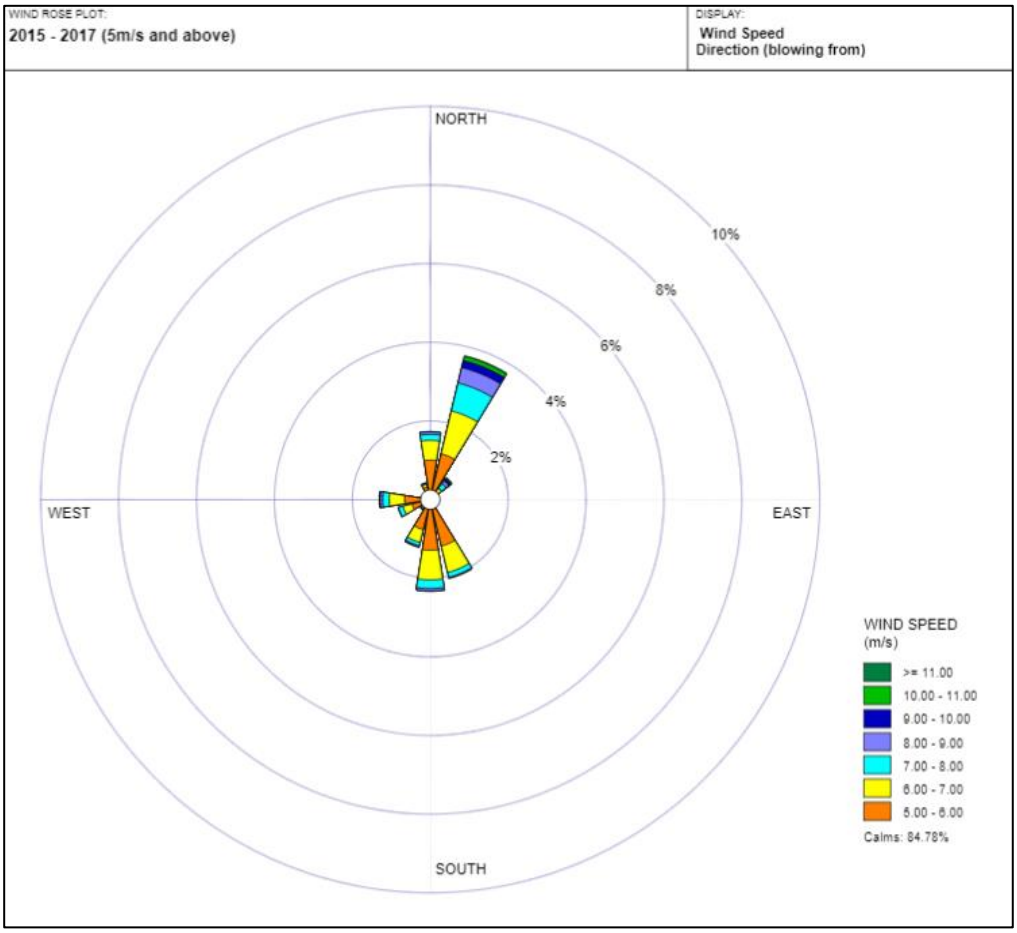

Figure 2 Windrose for the months of September to April for windspeeds greater than 5 m/s

3.4 Effects on Cherry Orchards

3.4.1 East of proposed expansion area (Lot 1)

The cherry orchard to the east of the proposed quarry expansion area and existing quarry will be downwind under winds from the west through to the north. Results from the monthly windrose data show that stronger winds (ie > 5m/s) from the west through the north are infrequent, occurring for ~3% of the time in October then reducing further through November and December. Winds from the west through north become very infrequent from December onwards.

While the orchard is close to the proposed expansion area (40-70m), the frequency of stronger winds blowing from the direction of the quarry site is low and continues to diminish to very low through the main harvest period December/January. While stronger winds from the west are infrequent, ongoing dust mitigation (as described in Section 7-3 of the Beca Technical Report) is appropriate to manage any dust generated on site. CCC has advised Beca that they are not aware of any dust damage that has occurred to the cherry orchard as a result of the operation of the existing quarry.

3.4.2 South of expansion area (Lot 2)

The cherry orchard to south of the expansion area and existing quarry will be downwind under winds from the northeast through the northwest. The orchard is approximately 100m from the existing quarry and at least 300m from the proposed expansion area at its closest point. Stronger winds (>5m/s) from the northeast are the most frequent through the period from September to the end of January when harvest will be completed (occurring 5-8% of the time). The existing quarry lies within the distance that dust could be transported under windy conditions and appropriate mitigation and monitoring (as described in Section 7-3 of the Technical Report) is appropriate to manage risk from dust deposition onto cherries. The 300m distance from the proposed expansion area is considered to be beyond the distance at which dust will travel and is therefore not considered a risk to cherries. CCC is also not aware of any dust damage that has occurred to this cherry orchard as a result of the operation of the existing quarry.

3.5 Effects on Vineyards

3.5.1 West of Luggate/Cromwell Road

The vineyards to the west of the Luggate Cromwell Road are downwind of the site under winds from the southeast thorough to east. Results from the monthly windrose data show that stronger winds (ie > 5m/s) from the southeast to east increase in frequency from October through December (~7% of time) before diminishing through January. Winds from these directions become very infrequent from February through the end of April (~2% of time).

The vineyards to the west of the Luggate/Cromwell Road are approximately 150m from the existing quarry and site entrance and at least 600m west of the proposed expansion area. These vineyards are at the limit at which dust generated from the site is likely to be transported under prevailing wind conditions and cause an adverse effect. CCC has advised Beca that they are not aware of any dust damage occurring to the vineyards as a result of the operation of the existing quarry. Regardless, mitigation and monitoring (as set out in Section 7-3 of the Technical Report) is considered appropriate to manage any dust generated onsite.

3.5.2 North of site

The vineyards located immediately to the north/northwest of the site (offices/yard area and main site entrance) and to the west/northwest of the proposed expansion area will be downwind under winds from the south through southeast. Results from the monthly windrose data show that stronger winds (ie > 5m/s)

from the south/southeast are infrequent from September through October before increasing slightly in frequency from November until January (~7% of time). Stronger winds from these directions diminish through February to ~2% of the time in April.

These vineyards are approximately 20m to the north/northwest of the site entrance and are therefore within the distance at which dust could travel under stronger winds from the south/southeast. CCC has advised Beca that they are not aware of any dust damage occurring to these vineyards as a result of the operation of the existing quarry. Nevertheless, the mitigation and monitoring (as set out in Section 7-3 of the Technical Report) is considered appropriate to manage any dust generated onsite.

The vineyards are approximately 300m east of the proposed expansion area which, is considered to be beyond the distance at which dust will travel and is therefore not considered a risk to grape production.

3.5.3 Southwest of site

The vineyard located to the southwest of the site is downwind of the existing quarry under winds from the north through to the east. Results from the monthly windrose data shows that stronger winds (ie >5m/s) from the north through to the east occur for up to 6.2% of time between September and January before decreasing in February and March.

The vineyard is located within 35 m of the boundary of the existing quarry and is therefore within the distance at which dust could travel under strong winds. CCC has advised Beca that they are not aware of any dust damage occurring to these vineyards as a result of the operation of the existing quarry. The mitigation and monitoring described in Section 7-3 of the Technical Report is considered appropriate to manage any dust generated on the existing site.

The vineyard is located approximately 520m to the west of the proposed expansion area, which is considered to be beyond the distance at which dust will travel and is therefore not considered a risk to grape production.

3.6 Proposed Mitigation and Monitoring

3.6.1 Cherry Orchards

As noted above, the cherry orchards on Lot 1 lie relatively close to the expansion area and may be vulnerable to dust deposition under relatively infrequent, stronger westerly to northerly winds blowing across the nearby proposed expansion area.

The cherry orchards along Amisfield Road (Lot 2) lie relatively close to the existing site and may therefore also be vulnerable to fine dust generated under relatively infrequent, stronger southerly winds blowing across the site.

3.6.2 Vineyards

As noted above, the vineyards in the vicinity of the site are all relatively close to the existing quarry and may be vulnerable to dust deposition under relatively infrequent strong winds. They are all located well beyond the distance from the proposed expansion area that dust is expected to carry and cause adverse effects.

3.6.3 Recommendation

It is recommended, that in order to avoid and mitigate the potential for adverse effects to result from the operation of the existing and proposed expanded quarry, the additional dust control and monitoring methods described in Section **Error! Reference source not found.** of the Technical Report are

implemented when quarry operations are located within 100 m of the boundary with orchards, vineyards and the DoC Reserve.

3.7 Conclusions

We have provided further assessment on the likely effects of dust on the neighbouring cherry orchards to the east and south of the site, as well as the vineyards to the west and north of the site entrance and to southwest of the site.

As noted in the Beca Technical Report, the orchards and vineyards in the vicinity are considered to have a "moderate to high sensitivity to dust", however, the potential effects of the site on these activities are considered to be 'negligible' or 'slight' due to the relatively inert nature of the dust, the low frequency of winds from directions of concern and the mitigation proposed by the applicant. It is also noted that dust generated from other sources outside the quarry is likely to be relatively frequent throughout the growing season, particularly during the drier summer months.

CCC has advised Beca that they are not aware of any dust damage occurring to nearby cherry orchards or vineyards as a result of the operation of the existing quarry.

The mitigation set out in Section 7-3 of the Technical Report is considered appropriate to manage the risks of any dust generated from quarry operations when sensitive receptors such as cherry orchards and vineyards, are located within 100 m of the site boundary.

4 Question 3

Please provide the anemometer height for meteorological data measured at the Fulton Hogan Quarry.

4.1 Overview

The air quality assessment (including windroses) is based on wind data from the Fulton Hogan site weather station located 2km to the south of the quarry. Fulton Hogan has advised that their meteorological instruments are located approximately 7.5 m above the surrounding ground level.

A photo of the weather station on the north boundary of the Fulton Hogan quarry is shown in Figure 3.

Figure 3 Photo of Fulton Hogan site weather station

4.2 Correlation of Winds at Quarry and Fulton Hogan Site Wind Data

The critical wind speed of 5 m/s for the pick-up of dust from unconsolidated surfaces is commonly recommended to be measured at a height of 10 m above ground level. Wind speed increases with height above the surface of the earth and hence a wind speed measured at 7.5 m above ground level will be recorded as a slightly lower windspeed than if it was recorded at a height of 10 m/s. Beca used the meteorological data recorded by Fulton Hogan at a height of 7.5 m to assess the frequency that winds in the vicinity of the quarry exceed a wind speed of 5 m/s. Hence the frequency of winds that exceed 5 m/s described in the Beca Report may have underestimated the frequency of winds that exceed 5 m/s measured at a height of 10 m.

The variation in wind speed with height above the ground is described in the following equation:

$$U_{z1}/U_{z2} = \ln(z_1/z_0) / \ln(z_2/z_0)$$[8]

Where

U_{z1} = the windspeed at the height of the corrected measurement height (m/s)

[8] https://www.homerenergy.com/products/pro/docs/latest/wind_resource_variation_with_height.html

U_{z2} = the windspeed measured at the anemometer height (m/s)

Z_0 = the surface roughness (m/s). For rough paddocks the surface roughness is assigned a value of 0.010 m/s.

Z_1 = the height of the corrected anemometer

Z_0 = the height of the measured anemometer

To calculate the difference in windspeeds measured at heights of 7.5 m and 10 m the following equation applies:

$$U_{10} / U_{/7.5} = \ln(10/0.01) / \ln(7.5/0.01)$$

$$= 1.04$$

Hence a windspeed of 5 m/s measured at a height of 7.5 m is equivalent to a windspeed of 5 x 1.04 = 5.2 m/s measured at a height of 10 m.

The difference in wind speeds of 4% is considered to be minimal and the use of wind data collected at a height of 7.5 m is unlikely to have any appreciable impact on the outcomes of the assessment of effects described in the Beca Report.

5 Question 4

Please provide an assessment on the potential increase in RCS emissions based on the quarry activities proposed and local conditions.

Respirable crystalline silica (RCS) can be produced by the crushing and grinding of quartz rich rock. The existing crushing plant is not proposed to move and is a considerable distance from the nearest sensitive receiver (>250m) and the prevailing wind conditions convey any dust discharges away from the closest sensitive receiver. While it is proposed to increase the volume of material processed, the separation distances that exist are well above nationally recognised distances to minimise the effects of both RCS and nuisance dust, with the mitigation and management techniques proposed. Regarding the expansion area, no processing of rock will take place in this area, it is extraction only, and appropriate mitigation and management of dust is proposed to minimise nuisance dust from this area.

6 Question 5

Please clarify if aggregate extraction and subsequent rehabilitation will be staged to limit the amount of exposed or active areas.

Where possible, the quarry will be progressively backfilled as has occurred to date. However the extent to which rehabilitation can be completed as quarrying progresses is limited as extracted material needs to be transported from the quarry face via the haul roads, which will pass through the proposed expansion areas of the quarry and the existing quarry, to the processing plant which will remain in the same location as at present. Furthermore, much of the current quarry has not been fully worked and the quarry requires room to stockpile products, which further limits the areas of the quarry that can be rehabilitated at present. The expansion area of the quarry will not be used for stockpiling and will be progressively rehabilitated in a manner consistent with the approved Quarry Rehabilitation Plan.

7 Question 6

Please clarify the location of product processing plant (including location of mobile processing plant). Provide the product processing rates and product types (i.e. AP65, AP40, crusher dust, etc.) of each processing plant. If applicable, provide information on any proposed setback distances of product processing plant from site boundaries and/or off-site receptors.

7.1 Overview

The existing location of the washing, screening and crushing plants will not change. The locations of these plants are shown in Figure 4, which has been reproduced from Figure 2-1 of the Beca Report.

7.2 Distances between Washing and Screening Plant, Site boundaries and Offsite Receptors

The approximate distances from the washing and screening plant to the site boundaries and off-site receptors are:

- 192 m from the vineyard to the southwest of the site
- 157 m from the southwestern boundary of the site.
- 140 m from the vineyards located on the northwestern boundary of the site
- 110 m from the boundary with 1308 Luggate Cromwell Road
- 300 m to the storage shed located at 1308 Luggate Cromwell Road
- 190 m from the southern boundary of the site
- 260 m from the orchards located to the south of the site
- 615 m from the eastern boundary of the expansion site
- 654 m from the orchards located to the east of the expansion area
- 300 m to the house at 1308 Luggate Cromwell Road
- 360 m from the Mahaka Katia Scientific Reserve
- 730 m to the house located at 90 Smiths Way
- 295 m to the vineyards located to the west of SH6

The closest sensitive receptor to the washing and screening plant is the vineyard located on the northwestern boundary of the site (140m). The closest site boundary to the washing and screening plant is the boundary with the property located at 1308 Luggate Cromwell Road (110m).

7.3 Distances between Crushing Plant, Site Boundaries and Off-site Receptors

The approximate distances from the crushing plant to the site boundary and off-site receptors are:

- 208 m from the vineyard to the southwest of the site
- 180 m from the southwestern boundary of the site
- 250 m from the vineyards located to the northwest of the site
- 247 m from the northwestern boundary of the site
- 85 m from the boundary with property with 1308 Luggate Cromwell Road
- 270 m from the storage shed located on 1308 Luggate Cromwell Road
- 137 m from the southern boundary of the site
- 220 m from the orchards located to the south of the site

- 550 m from the eastern boundary of the expansion site
- 575 m from the orchards located to the east of the expansion area
- 330 m to the house on 1308 Luggate Cromwell Road
- 370 m to the boundary with Mahaka Katia Scientific Reserve
- 660 m to the house located at 90 Smiths Way
- 360 m from the vineyards located to the west of SH6.

The closest sensitive receptor to the crushing plant is the vineyard located to the southwest of the site (208m). The closest site boundary to the crushing plant is the boundary with the property located at 1308 Luggate Cromwell Road (85m).

7.4 Plant Processing Capacity and Products

The quarry does not measure the processing rates for the various product types. However, the washing and screening plant has a processing capacity of 250 tonnes per hour and the crushing plant has a processing capacity of 150 tonnes per hour.

The products that are produced in the washing and screening plant include:

- Gabion rock
- Sump rock
- Aggregates in the size ranges of 20 – 40 mm, 20 mm, 13 mm, 8 mm and sand.

The crushing plant produces:

- AP65
- AP40
- AP20
- GAP32
- Crusher dust
- Crushed scalpings
- 20 mm chip and
- 13 mm chip.

CCC is seeking a resource consent for the maximum capacity of the washing plant, which is 250 tonnes per hour, noting that it generally operates at 150 tonnes per hour.

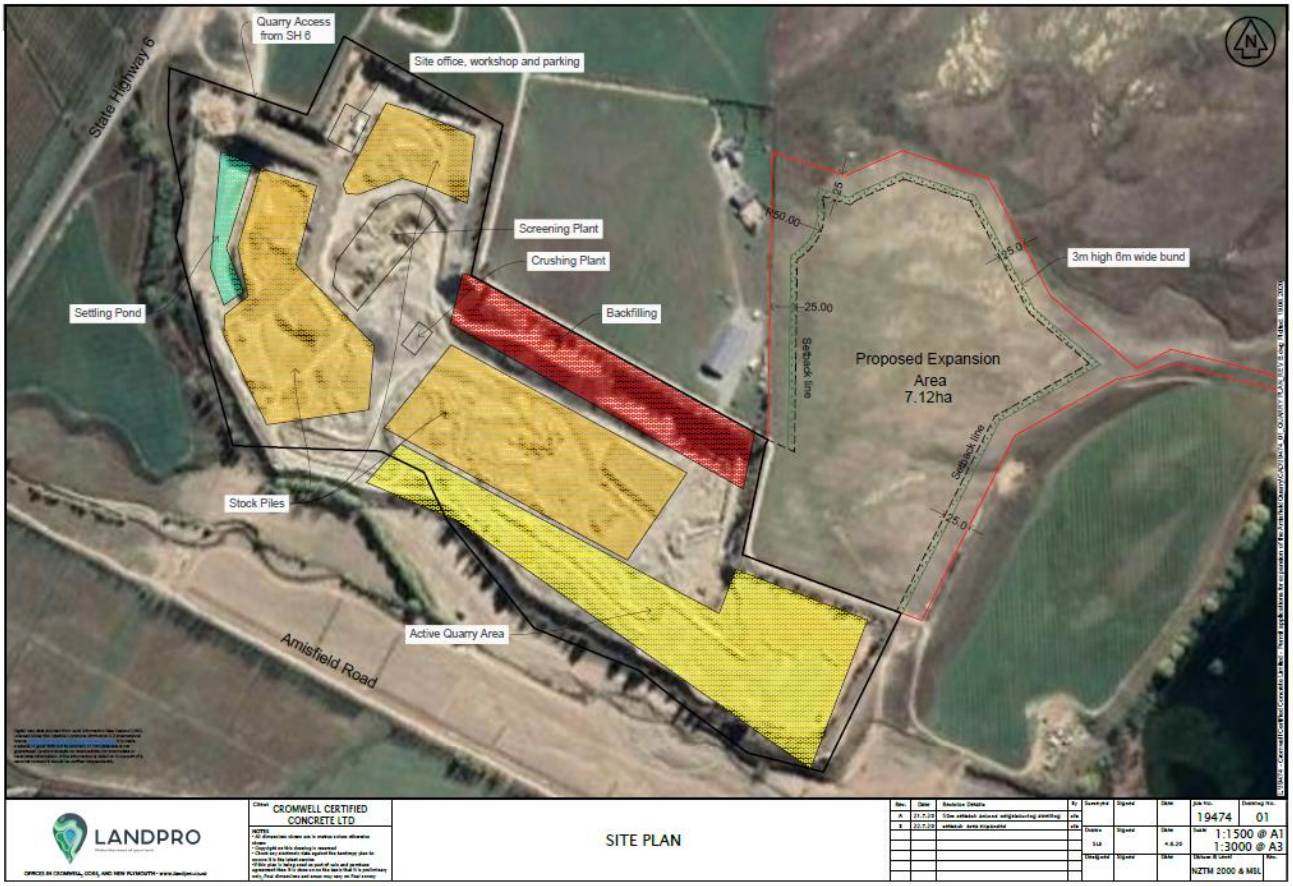

Figure 4 Site plan of the quarry showing the location of the washing and screening plant and the crushing plant (reproduced from Figure 2-1 of the Beca Report)

8 Question 7

There is a vineyard adjacent to the southwestern boundary of the existing quarry. It appears that this vineyard has not been identified as a sensitive receptor. Please assess the potential for air quality effects on this vineyard.

8.1 Effects from Expansion Area

The vineyard to the southwest of the existing quarry is located at least 520m to the southwest of the expansion area and beyond the distance that adverse effects due to dust are expected to occur.

8.2 Effects from Existing Quarry

The vineyard is located approximately 35m from the southwestern boundary of the existing quarry. The vineyard is downwind of the existing quarry in winds from the north through to the east. Winds from these directions that exceed 5 m/s occur for approximately 8.3% of time. An assessment of the potential risks of

dust causing adverse effects on the vineyard has been carried out using the IAQM[9] method described in the Technical Report. A summary of the results of the assessment is shown in Table 2.

Table 2: Summary of IAQM Assessment for Vineyard on SW boundary

Receptor details and location	Location relative to nearest dust source	Frequency of winds >5m/s (%)	Residual source emissions	Pathway effectiveness	Dust impact risk	Receptor sensitivity	Magnitude of dust effect
Vineyard	35 m southwest of existing workings and 520m west of expansion area	8.3	Medium	Moderately effective	Low	Medium to high	**Slight adverse effect**

The IAQM method assesses the level of risk of adverse effects occurring as "low" and the magnitude of effects as a "slight adverse effect". When strong winds are blowing towards the vineyard in dry conditions it is important that the quarry diligently implements the recommended dust control methods, including the additional methods recommended in Section **Error! Reference source not found.** of the Technical Report. Providing these dust control methods are implemented, any residual dust should be adequately mitigated to the extent that it will not be offensive or objectionable and any adverse effects will be minimal.

The potential effects of dust on the grapes grown in the vineyard are discussed in the response to Question 2.

We trust this information answers your questions adequately.

Yours sincerely

Prue Harwood
Senior Associate – Environmental Advisory

on behalf of

Beca Limited
Phone Number: +64 3 4773 138
Email: prue.harwood@beca.com

[9] Institute of Air Quality Management (2016) *Guidance on the Assessment of Mineral Dust Impacts for Planning"*

Attachment A – Draft Air Quality Management Plan

Amisfield Quarry - Draft Air Quality Management Plan

Prepared for Cromwell Certified Concrete Limited

Prepared by Beca Limited

3 March 2021

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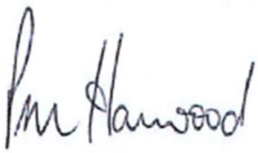
Revision History

Revision Nº	Prepared By	Description	Date
A	Graeme Jenner	Draft for client review	1 March 2021
B	Graeme Jenner	Final Draft for Consent Application	3 March 2021

Document Acceptance

Action	Name	Signed	Date
Prepared by	Graeme Jenner		3 March 2021
Reviewed by	Prue Harwood		3 March 2021
Approved by	Graeme Jenner		3 March 2021
on behalf of	Beca Limited		

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1 Introduction

1.1 Background

Cromwell Certified Concrete Ltd (CCC) operates the Amisfield Quarry located on predominantly flat land off Luggate Cromwell Road (State Highway 6). The work involves activities that could generate dust if not adequately managed. Residential dwellings, consented building platforms, horticulture (orchards and vineyards) and Department of Conservation land are located close to the site.

CCC plan to expand the annual production of aggregate at the site from 70,000 to 200,000m^3 per year. This expanded production exceeds the permitted extraction rate of 100,000m^3 per year and requires consent under Rule 16.3.5.3 of the Regional Plan: Air for Otago (Air Plan). The operating area of the expanded quarry is approximately 27ha.

1.2 Purpose

The purpose of this draft Air Quality Management Plan (AQMP) is to provide a framework for the management and mitigation of discharges of dust from the expanded quarry. The AQMP provides supporting information to the application made by CCC for an air discharge consent at the quarry site. The AQMP will be updated and finalised following granting of consent.

This AQMP is a working document and will be regularly reviewed and revised (if required) as site activities progress. A copy of the most up-to-date AQMP will be kept on site and made available to all staff.

1.3 Air Quality Control Objectives

The air quality control objectives of this AQMP are to:

- Mitigate dust emissions from all quarry operations;
- Ensure compliance with resource consent conditions, including maintaining the air quality monitoring programme;
- Manage air emissions to protect human health and the environment;
- Monitor areas of community concern;
- Ensure that emissions are within Workplace Exposure Standards and are not objectionable or offensive;
- Respond quickly to complaints and non-compliances and to communicate mitigation undertaken; and
- To continue to identify best practicable options and investigate and trial new methods, products and technologies to further minimise and mitigate the adverse effects of dust.

1.4 Guidance Documents

This AQMP has been prepared to comply with the CCC Environmental Policy 2020 - (see **Appendix A**). The AQMP has also been prepared in accordance with Appendix 4 of the *Good Practice Guideline for Assessing and Managing Dust* (GPG Dust)[1] that describes the items that should be included in a dust management plan.

1.5 Resource Consent

The quarry activities are subject to the conditions included in Consent **xxx**, granted by Otago Regional Council on **xx/2021**. A copy of Consent **xxx** is attached as **Appendix B.**

[1] Ministry for the Environment. *2016. Good Practice Guide for Assessing and Managing Dust. Wellington:* Ministry for the Environment. (November 2016). Publication No. ME 1277.

2 Process Description and Surrounding Environment

2.1 Overview

CCC extracts and processes aggregate at the quarry for use in local infrastructure projects. The quarry uses truck and shovel methods to extract the raw aggregate and crushes and screens this material to produce a range of finished products of varying grades.

2.2 Site Meteorological Conditions

There is no long-term meteorological data currently available for the quarry site. A permanent on-site meteorological station will be set up and operated as part of the requirements of this AQMP.

The nearest climate station is at the Fulton Hogan site 2km south of the quarry which provides a good representation of wind condition at the quarry.

The windrose in Figure 1 shows that winds blow predominantly from the north to northeast and that the strongest winds also come from this direction. Secondary winds blow from the southwesterly quarter. Winds from the east and west are rare.

The average wind speed measured during the monitoring period was 2.1 m/s which is relatively low compared to many places in Otago. The percentage of winds which exceed 5 m/s, the critical windspeed for pickup of dust from unconsolidated surfaces, from all directions is 10.2% and the percentage of strong winds exceeding 10 m/s is 0.6%.

An analysis of winds during the period September to April (using 2019 Fulton Hogan site data) shows a similar pattern to the annual wind data. This period is particularly applicable to the cherry and grape growing season when excessive dust deposition could adversely affect crop health and production.

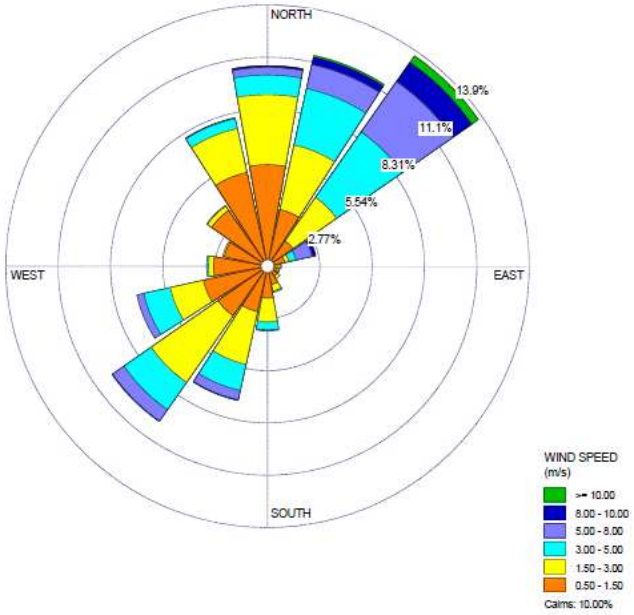


Figure 1 Windrose based on 2019 data from nearest climate station (Fulton Hogan site)

2.3 Sensitive Receptors

2.3.1 Overview

The risk from dust emissions depends on the proximity of receptors (such as residential dwellings) to dust generating activities and the frequency and duration of meteorological conditions that are conducive to the transport of dust (ie dry conditions with strong winds in the direction of receptors).

There are several sensitive human receptors (residences) in the vicinity of the boundary of the project area. The main land use in the vicinity of the site is horticulture (vineyards and orchards) and unirrigated grazing land and the main sources of air contaminants are those typical of rural areas such as unsealed roads, unvegetated fields and domestic heating. The plan in **Appendix C** shows the location of these receptors in relation to the quarry.

2.3.2 Human receptors

The property to the north of the quarry owned by the Clarks includes land used for a dwelling and a storage business. The Clark residence is located approximately 220 m north of the northern boundary of the existing quarry and approximately 30 m to the west of the boundary with the proposed expansion area. The Clarks storage shed is located approximately 35 m north of the northern boundary of the existing quarry and approximately 20 m west of the western boundary of the proposed expansion area.

There is a residence located at 90 Smiths Way which is approximately 360 m to the south of the southern boundary of the existing quarry and to the south of Amisfield Road.

There is a residence located approximately 100 m to the northwest of the quarry entrance at 7 Mt Pisa Road and another located approximately 270 m west of the western extent of the working area of the existing quarry.

Two building platforms have been consented on Lots 1 DP 508108, and Lot 2 DP 508108. These platforms are located at a 25m setback from the quarry site boundary.

2.3.3 Horticultural receptors

There are cherry orchards on land owned by the Littles on a lower river terrace to the east of the expansion area and to the south of the existing quarry. There are buildings which are understood to be used for temporary worker accommodation located on the Little's eastern cherry orchard. These buildings are located approximately 160m east of the existing quarry and 140 m southeast of the southern boundary of the proposed expansion area.

To the west and southwest of the quarry across Luggate Cromwell Road, to the north of the quarry entrance and to the southwest of the quarry, are established vineyards.

2.3.4 Ecological receptors

To the north of the proposed expansion area is a Department of Conservation (DoC) reserve in which several rare plants are found.

3 Responsibilities

3.1 Overview

CCC, as the holder of Consent **xxx,** has overall responsibility to ensure that all statutory requirements and consent conditions are complied with and that all site activities are carried out in accordance with the requirements of this AQMP.

3.2 Quarry Manager

The Quarry Manager is responsible for ensuring that the legal and other requirements in this AQMP are fulfilled and the resources are available to achieve this.

The Quarry Manager is specifically responsible for:

- Developing, implementing and maintaining the site air quality management programme identified in this AQMP;
- Fulfilment of all site monitoring and reporting requirements under the air discharge consent and this AQMP;
- Ensuring that all site employees and contractors are aware of the requirements of this AQMP and are inducted and trained (as necessary) in air quality management and mitigation procedures;
- Responding to complaints and liaising with the community.
- Review of this AQMP on at least an annual basis, or sooner if required by changing site activities.

3.3 Site Foreman

The Site Foreman will be responsible for all site related air discharge management procedures when the Quarry Manager is not on site.

3.4 Contractors

All contractors working on site are responsible for ensuring that their activities comply with the requirements of this AQMP and the directions of the Quarry Manager (or the Site Foreman in the Manager's absence).

4 Complaints Response

4.1 Overview

Complaints may be referred by one or more of the Otago Regional Council, a member of the public or a member of the site team. The Quarry Manager is responsible for ensuring suitably qualified personnel are available to respond to complaints at all times. It is the responsibility of the Quarry Manager (or the Site Foreman in the Manager's absence) to respond to and follow up all complaints regarding dust.

A Complaints Register will be maintained by the Quarry Manager and forwarded to the Consents Compliance Manager at the Otago Regional Council on request.

4.2 Actions Following Receipt of Complaint

As soon as possible after receipt of a complaint, the Quarry Manager will:

- Undertake a site inspection and note all dust generating activities taking place and the mitigation methods being used;
- Visit the area from where the complaint originated to ascertain if dust is still a problem (as soon as possible ie within 2 hours, where practicable). If it becomes apparent that there may be a source of dust other than from the quarry site, it is important to verify this (take photos of the source and emissions);
- Liaise with relevant site staff and if necessary, undertake any remedial actions to prevent any recurrence of the problem.

As soon as possible after initial investigations have been completed, the Quarry Manager will contact the complainant to explain any problems found and remedial actions taken.

As soon as practicable following receipt of a complaint, the Quarry Manager will notify the Consents Compliance Manager, Otago Regional Council. The following details will be logged in the Complaint Register:

- Type and time of complaint;
- Description of emission (constant/intermittent; duration, time of day);
- Name and address of complainant (if available);
- Location from which the complaint arose;
- Wind direction and estimate of wind speed at the time of complaint (see Beaufort Scale[2] in **Appendix D**);
- The likely cause of the complaint;
- The response made by the consent holder; and
- The action taken or proposed as a result of the complaint.

4.3 Induction and Training

It is the responsibility of the Quarry Manager to implement an induction and on-going training programme for all staff and contractors. The purpose of this programme is to make all personnel working on site aware of, and understand, the purpose and requirements of the AQMP, the air discharge consent conditions and the ramifications of a failure to comply with these requirements.

The training programme for all staff and contractors will include at least the following aspects:

[2] The Beaufort Scale is a system for estimating wind strengths without the use of instruments, based on the effects wind has on the physical environment. The behaviour of smoke, waves, trees, etc., is rated on a 13-point scale of 0 (calm) to 12 (hurricane).

- Responsibilities for carrying out the work on site in a manner which does not result in adverse effects on the environment and local residents and in accordance with resource consent conditions;
- The potential legal ramifications of adverse environmental effects occurring as a result of the project and non-compliance with resource consent conditions;
- The minimum requirements for dust control for all activities on site;
- The requirements to monitor weather and visually inspect the site for dust discharges, assess the adequacy of dust control methods and implement additional dust control methods when required;
- The actions to be taken in an extreme dust and weather event;
- The actions to be taken if a complaint is received from the public or consent authority.

Additional training will be provided to water cart operators, in assessing whether sufficient water has been applied for effective dust suppression.
Staff and contractors will be regularly updated on any changes or amendments to the AQMP or improvements in site air quality management procedures.

5 Dust Sources and Risks

5.1 Nature of Dust

Dust is comprised of a wide range of size fractions. The larger settleable material (generally greater than 50 µm[3] in diameter) can soil surfaces and cause irritation to eyes and the nose. However, because it is relatively large in size, settleable material is usually deposited onto the ground in open areas within a short distance (approximately 100 - 200 m) from the source.

The finer fractions of dust (commonly referred to as total suspended particulate or TSP), are generally less than 20 µm in diameter and can be transported larger distances downwind. The portions of TSP that pose the greatest risk to health are those less than 10 µm in diameter (known as PM_{10}) and particulates less than 2.5 µm in diameter (known as $PM_{2.5)}$. The major source of finer particulate in the atmosphere is from the products of combustion. While most of the particulate generated from the quarry site will be larger fractions (i.e. greater than 10 µm), a portion will fall into the smaller size ranges.

Excavated material may contain crystalline silica. Consequently, the dust created during any mechanical processes will also contain a proportion of crystalline silica. Fine particles of crystalline silica (less than 10 µm) that are able to be inhaled deep into the lungs, known as respirable silica, can cause significant adverse human health effects (silicosis) if people are exposed to concentrations above recommended guideline levels over extended periods of time. Mechanical crushing may result in some minor amounts of finer dust, that may contain crystalline silica, Finer dust may also be generated during materials handling and from vehicle movements on unpaved roads.

5.2 Dust Sources

The activities that have the potential to generate dust at the quarry include:

- Excavation and stripping of overburden;
- Extraction of gravel;
- Overburden stockpiling;
- Raw and finished material stockpiling;
- Loading and unloading of materials;
- Vehicle movements;
- Crushing and screening of gravel; and
- Backfilling of worked areas.

5.3 Dust Generation Factors

The five major factors which influence the potential for dust to be generated from the quarry are:

- Wind speed across the surface (the critical wind speed for dust pick-up from surfaces without disturbances such as traffic is 5m/s - above 10m/s the pick-up increases significantly);
- The percentage of fine particles in the material on the surface;
- Moisture content of the material;
- The area of exposed surface; and
- Vehicle movements on unconsolidated surfaces.

[3] µm (or micron) which is equal to 0.001mm

5.4 Risks from Dust

The assessment of potential effects prepared in support of the consent application has identified that in the absence of appropriate mitigation, there is a moderate to high risk of infrequent, short duration adverse dust effects at nearby houses, (including future houses when constructed), orchards, vineyards and the DoC reserve.

The quarry is subject to higher wind speeds at times which have the potential to mobilise and transport dust from the site. The assessment of effects anticipates that areas up to approximately 200 m from quarrying activities may be potentially affected by dust under worst case wind conditions. This assumes that appropriate dust mitigation measures are not implemented.

6 Dust Mitigation and Monitoring

6.1 Mitigation

CCC will use the following methods to manage dust from quarry activities:

6.1.1 Stripping of overburden, stockpiling and backfilling

- Minimising access to the working area to essential vehicles;
- Minimising areas of exposed surfaces;
- Planning potentially dusty activities such as stripping for days when weather conditions are favourable;
- Locating stockpiles below ground level as far as practicable; and
- Using water and/or dust suppressants[4] on stockpiles and working areas to keep exposed or disturbed surfaces damp as required.

6.1.2 Extraction of gravel

Aggregate extraction takes place below natural ground level at varying depths. The pit walls shelter the working areas from the wind and reduce the wind speeds at the excavation surface. Consequently, most dust generated from the extraction and loading activities is contained within the confines of the pit. While the gravel is naturally damp when it is extracted, a water cart will be used to dampen the haul roads and the working areas if required.

No blasting will occur at the site.

6.1.3 Loading and unloading of materials

- Using water sprays on the falling materials if required;
- Minimising drop heights as far as practicable; and
- Undertaking loading and unloading activities below ground level as far as practicable.

6.1.4 Processing of aggregate

Water sprays will be used throughout the crushing and screening plants to control the moisture content of the materials and limit dust production. The crushing plant is located on the pit floor, which shelters the area from the wind and contains any dust produced within the pit walls.

6.1.5 Vehicles, roads and yard areas

- Minimising access to the working areas to essential vehicles;
- Imposing vehicle speed limits on site and access roads;
- Keeping unsealed site and access road surfaces damp with water and/or dust suppressants[5] from fixed and moveable sprays and a water truck;

[4] Haul loc ™ is used daily on the haul roads. Haul-loc is a liquid polymer that is added to water carts to reduce the water required for continuous dust suppression by up to an estimated 65% with extended dust suppression effects. Haul-Loc is designed to be applied using existing site water trucks, tankers, or sprinklers. Mixed with water, Haul-Loc is sprayed onto road surfaces binding fine dust particles and preventing them from becoming airborne dust.

[4] Rubble loc™ is a similar product to Haul-loc and is used as required across the site (for example prior to long weekends or before forecast high winds). Rubble-loc is designed for use on dynamic sites such as quarries with material stockpiles. The product is designed to provide long term dust treatment.

[5]

- Covering loads of fine dusty materials leaving the site where practical;
- Maintaining unsealed internal haul roads and access roads by grading and the laying of fresh gravel; and
- Regularly removing deposited debris from the sealed entrance road to the quarry.

6.1.6 Water supply for dust suppression

The GPG Dust recommends that an application rate of 1 l/m^2/hr of water may be needed for areas requiring dust control. This application rate does not need to be applied over every square metre of ground for every hour of every day, but sufficient water will be available for application as required.

CCC has two bores on site with a combined capacity of 45 litres per second. CCC is also applying to increase the existing water take to 70 litres per second. The current water supply is sufficient to apply the recommended water application constantly to an area of 16 ha and, if granted, a supply of 70 litres per second would be sufficient to water an area of 25 ha. The working area of the quarry, which requires dust suppression is estimated to be approximately 3 ha.

The use of the additives Haul loc and Rubble loc for dust suppression reduces the overall site dust suppression water requirements.

6.1.7 Management of dust when quarry not operating

The potential for dust emissions is low when the quarry is not operating. Windblown dust from unstabilised open areas is the only major source of dust and these areas will be minimised as far as practicable. The Quarry Manager will actively monitor weather forecasts for strong winds and receive TSP alerts/alarms via mobile phone as outlined below. Appropriate dust control measures such as watering will then be implemented as required.

6.2 Monitoring Programme

6.2.1 Instrumental monitoring close to sensitive receptors

Monitoring of TSP and windspeed and direction will be carried out using real time instruments. The TSP instrument(s) can be relocated as the active working area of the quarry moves (ie within 100m of sensitive receptors identified in Table 1).

Table 1 Sensitive receptors close to working quarry boundary

Receptor	Distance from nearest dust source
Clark residence	30m west of expansion area/80m from workings
Clark residence	210m north of existing quarry
Clark storage shed	30m west of expansion area/80m from workings
Clark storage shed	45m from existing quarry
Little worker accommodation	190m east of existing quarry boundary
Little worker accommodation	150m southeast of expansion area
Little eastern orchard	40m east of expansion area/65m east of workings
Little southern orchard	70m south/southeast and southwest of workings
Western vineyards	70m west of eastern quarry boundary
Southwestern vineyard	35m southwest of southwestern boundary
DoC Reserve	25m north of quarry boundary
Building platforms on Lots 1 DP 508108, and Lot 2 DP 508108 [1]	25m from quarry boundary

1 Become sensitive receptors when dwellings constructed

The instruments will be monitored remotely at one (or more locations if required) and will send an alarm when TSP or wind speed approach trigger values (see Tables 2 and 3).

Table 2 TSP Trigger methods and values

Trigger methods	Trigger Values (measured at the on-site monitoring station)	Actions
TSP Alert	TSP concentration (5 min average) measured on site exceeds 200 **µg/m^3** or TSP concentration (1- hour average) **170 µg/m^3,** or TSP concentration (24-hour average) **exceeds 50 µg/m^3**	Dust sources and dust control measures within 200 m of downwind sensitive receptors located within 100 m of the project boundaries will be reviewed and additional dust control methods shall be implemented if necessary.
TSP Alarm	TSP concentration (5 min average) measured on site exceeds 250 **µg/m^3 or** TSP concentration (1-hour average) **exceeds 200 µg/m^3 or** TSP concentration (24-hour average) **exceeds 60 µg/m^3**	Contributing dust generating activities will cease within 200m of downwind receptors located within 100m of the project boundaries except for dust control activities.

Table 3 Trigger values for wind speed

Trigger methods	Trigger Values (measured at the on-site monitoring station)	Actions
Wind Speed Alert	Hourly average wind speeds exceed **5 m/s** as measured on site and winds are blowing towards sensitive receptors located within 100 m of the boundary of the project boundaries.	Dust sources and dust control measures within 200 m of downwind sensitive receptors located within 100 m of the project boundaries will be reviewed and additional dust control methods shall be implemented if necessary.
Wind Speed Alarm (note this does not apply during rain events)	• Gust wind speeds (two-minute average or less) exceed **10 m/s** as measured on site during two consecutive ten-minute periods and winds are blowing towards sensitive receptors within 100m of the project boundaries. • Works may recommence when wind gusts (two-minute average or less) are **less than 7.5 m/s** during the previous two consecutive ten minute periods.	Contributing dust-generating activities will cease within 200 m of sensitive receptors located within 100 m of the project boundaries except for dust control activities.

6.2.2 Visual Monitoring

Visual monitoring of dust discharges will also be carried out on site. Table 4 shows the monitoring activities and their frequency.

Table 4 Visual dust monitoring programme

Monitoring Activities	Frequency
Check weather forecasts for strong winds and rainfall	Daily
Inspect site entrance and paved areas for the presence of soil deposits	Twice daily
Observe weather conditions as measured by the onsite weather station and in particular wind speed.	Daily and as conditions change.
Visually inspect all exposed unstable surfaces for dampness and review the use of the water cart or sprinklers if necessary.	Daily and as conditions change.
Visually inspect stockpiles of potentially dusty materials to ensure dampness and stabilisation.	Daily and as conditions change.
Visually inspect unpaved yard areas and haul roads to ensure surfaces are covered in coarse material or are damp.	Daily and as conditions change.
Visually inspect all dust generating activities to ensure dust is effectively controlled and review water application rates.	Daily and as new conditions begin. Hourly in winds exceeding 5m/s.
Visually inspect the crushing and screening plants to check that dust is effectively controlled.	Twice daily when plants are operating.

7 Reporting

The Quarry Manager will complete a daily dust inspection log form (see example in **Appendix E**) and maintain the record on site. The following information will be recorded:

- Any dust control equipment malfunctions and any remedial actions taken;
- Results of visual inspections of dust emissions and dustfall
- General weather conditions (eg windy/calm, warm/cool, rain/dry);
- The quantity of dust suppressants used;
- Frequency of water cart/sprinkler (as appropriate) use.

Air quality monitoring data is kept in a database and reviewed as it is entered against applicable trigger levels and consent limits. CCC will notify the Consents Compliance Manager, Otago Regional Council of any non-compliance as soon as practicable.

Results from monitoring and other air quality matters including any complaints/responses and subsequent mitigation will be summarised in an Annual Air Quality Monitoring Report and submitted to the Consents Compliance Manager, Otago Regional Council.

The Annual Air Quality Monitoring Report will:

- Summarise all relevant air quality data/information for the previous calendar year as required by consent;
- Summarise any trends arising from the monitoring programme;
- Comment on consent compliance and any difficulties in achieving compliance with consent conditions; and
- Describe any additional mitigation or works undertaken (or proposed) to improve air quality performance will be described.

8 Review

The site AQMP will be reviewed at least annually by the Quarry Manager to ensure that the procedures and controls are up to date. More frequent updating of the Plan may occur in response to a change in site activities, or in response to a complaint or consent non-compliance.

The review will consider:

- Compliance to date with consent conditions and AQMP requirements;
- Any significant changes to site activities or methods since the previous review;
- Any changes to key site roles and responsibilities since the previous review;
- Results of inspections, monitoring, and reporting procedures associated with the management of site air quality;
- Any comments or recommendations from the Otago Regional Council regarding site operations; and
- Unresolved complaints and/or any remedial actions undertaken in response to complaints.

Site staff will be informed of any significant changes through regular communication processes. The updated AQMP will be forwarded to the Consents Compliance Manager, Otago Regional Council.

A

Appendix A – CCC Environmental Policy

AMISFIELD QUARRY

ENVIRONMENTAL POLICY

Amisfield Quarry will manage all activities with concern for our local community and the environment. We will manage our quarrying operations in a way that will ensure there is no adverse impact on the environment.

WE WILL ACHIEVE THIS BY

- Complying with and operate in accordance with the approved resource consent conditions and applicable laws and regulations
- Implementing environmental related safe work practices, systems and procedures
- Implementing measures to prevent pollution
- Using robust systems to identify and evaluate the environmental risks
- Understanding the environmental impact of the materials, plant and equipment we work with
- Seeking employee contribution to identify initiatives to improve environmental performance and contribute to a healthier and safer environment at our site
- Working closely with our contractors and subcontractors to ensure they meet our expectations
- Monitoring, control and record waste disposal in accordance with resource consents and statutory requirements to minimise impact on the environment

Brian McNulty *Amisfield*
Quarry Director

Travis Allison
Amisfield Quarry
Quarry Manager

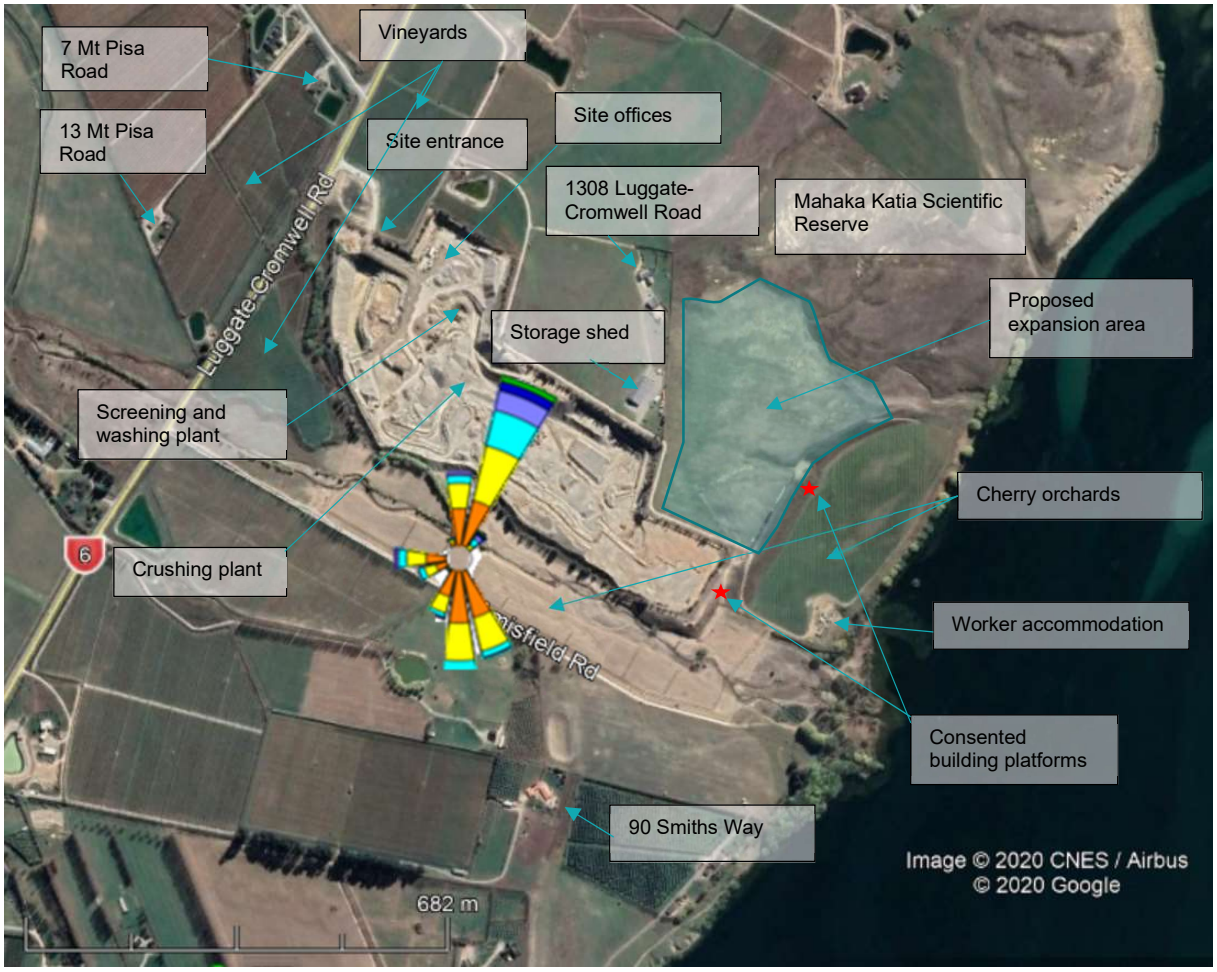
Date: 9 November 2020

B

Appendix B – Copy of Consent xxx

C

Appendix C – Locations of Sensitive Receptors


7 Mt Pisa Road
13 Mt Pisa Road
Vineyards
Site entrance
Site offices
1308 Luggate-Cromwell Road
Mahaka Katia Scientific Reserve
Proposed expansion area
Storage shed
Screening and washing plant
Cherry orchards
Crushing plant
Worker accommodation
Consented building platforms
90 Smiths Way
Luggate-Cromwell Rd
6
682 m
Image © 2020 CNES / Airbus
© 2020 Google

D

Appendix D – Beaufort Windscale

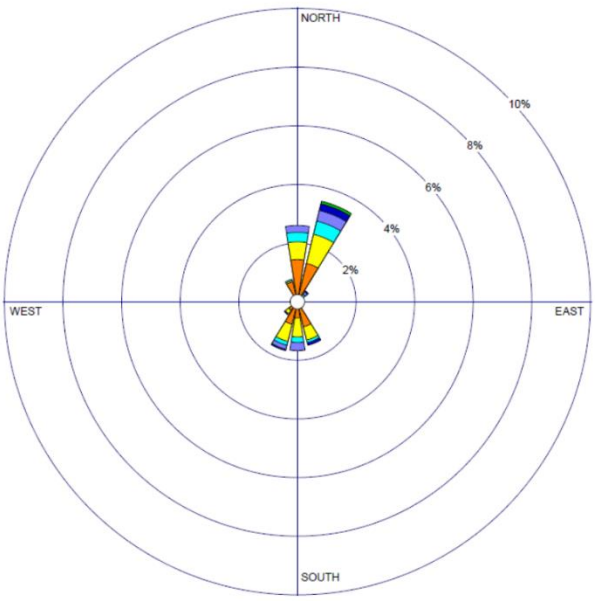
Wind Force	Description	km/h	mph	knots	Specifications
0	Calm	<1	<1	<1	Smoke rises vertically
1	Light Air	1-5	1-3	1-3	Direction shown by smoke drift but not by wind vanes
2	Light Breeze	6-11	4-7	4-6	Wind felt on face; leaves rustle; wind vane moved by wind
3	Gentle Breeze	12-19	8-12	7-10	Leaves and small twigs in constant motion; light flags extended
4	Moderate Breeze	20-28	13-18	11-16	Raises dust and loose paper; small branches moved.
5	Fresh Breeze	29-38	19-24	17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	Strong Breeze	38-49	25-31	22-27	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	Near Gale	50-61	32-38	28-33	Whole trees in motion; inconvenience felt when walking against the wind.
8	Gale	62-74	39-46	34-40	Twigs break off trees; generally impedes progress.
9	Strong Gale	75-88	47-54	41-47	Slight structural damage (chimney pots and slates removed).
10	Storm	89-102	55-63	48-55	Seldom experienced inland; trees uprooted; considerable structural damage
11	Violent Storm	103-117	64-72	56-63	Very rarely experienced; accompanied by widespread damage.
12	Hurricane	118 plus	73 plus	64 plus	Devastation

E

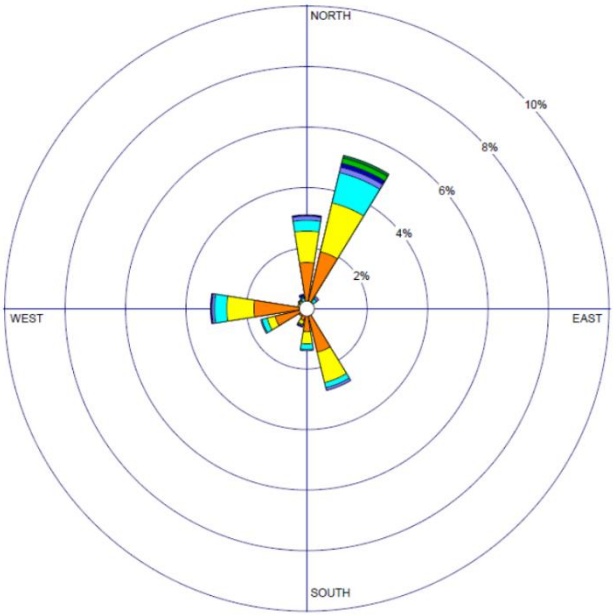
Appendix E – Example Dust Inspection Log Form

Name:							Location of observations						
Month:													
Date	Time	Dust event duration (days/ hours/mins)	Continuity of the dust for this event (tick one)				Type of dust	Likely source of dust	Intensity (0–6, see over)	Description of effect of dust	Wind direction (see over)	Wind strength (Codes 0–7, see over)	Additional comments?
			Contin-uous	Most of the time	<50% of the time	Intermittent							

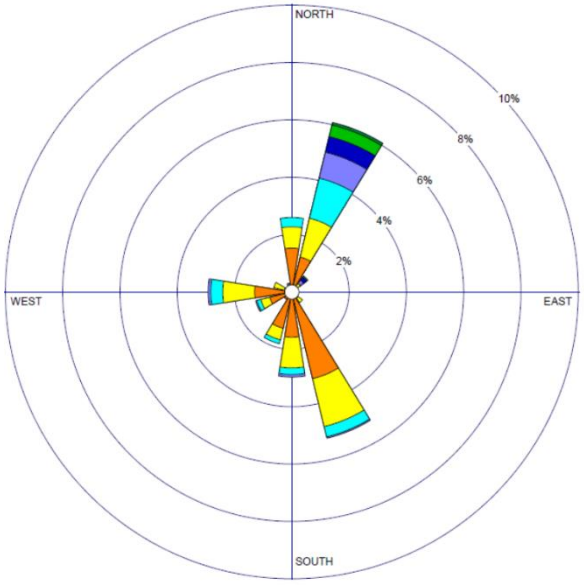
Attachment B – Monthly Windroses for Windspeeds Greater than 5m/s (2015-2017)



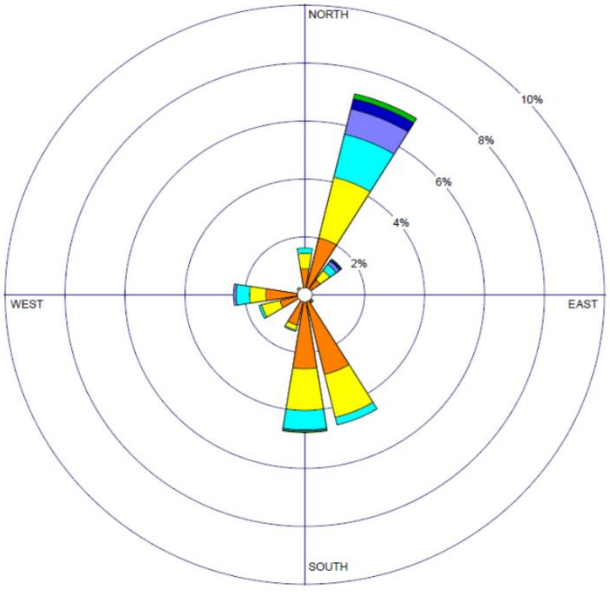
September



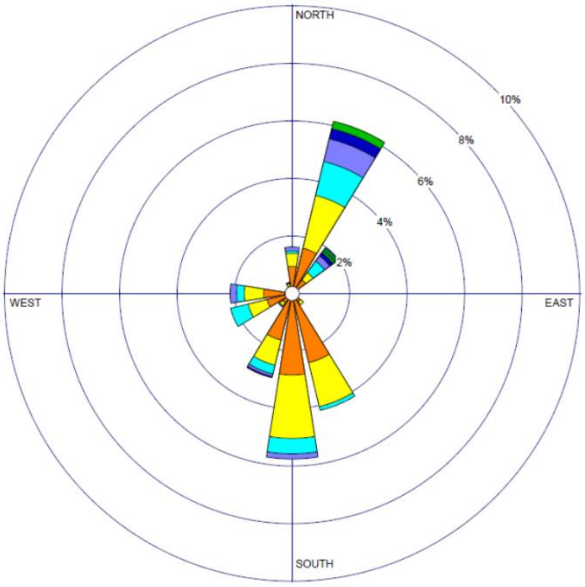
October



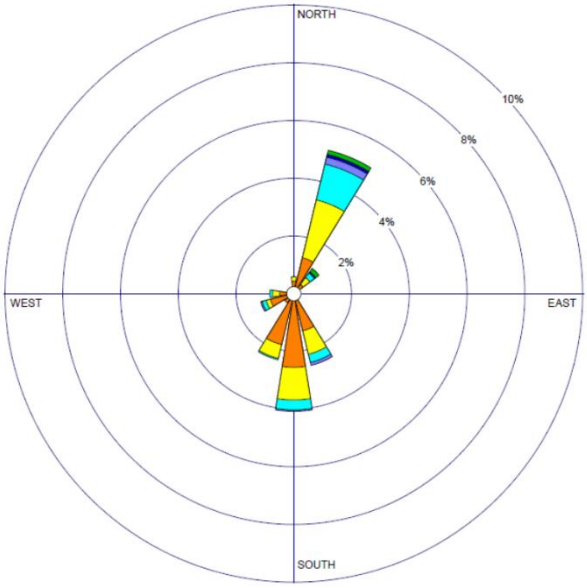
November



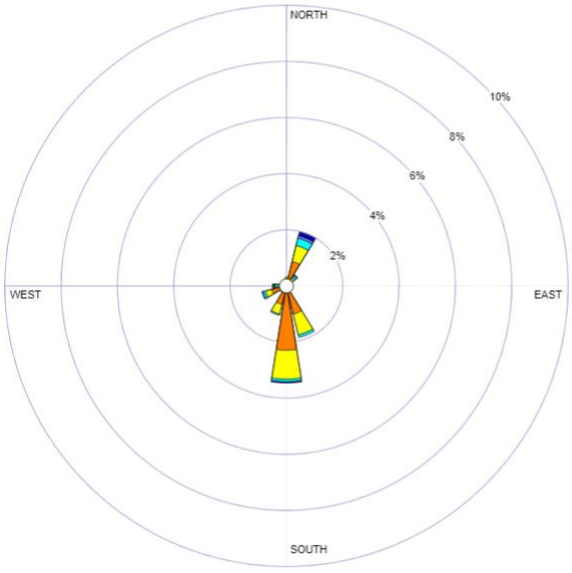
December



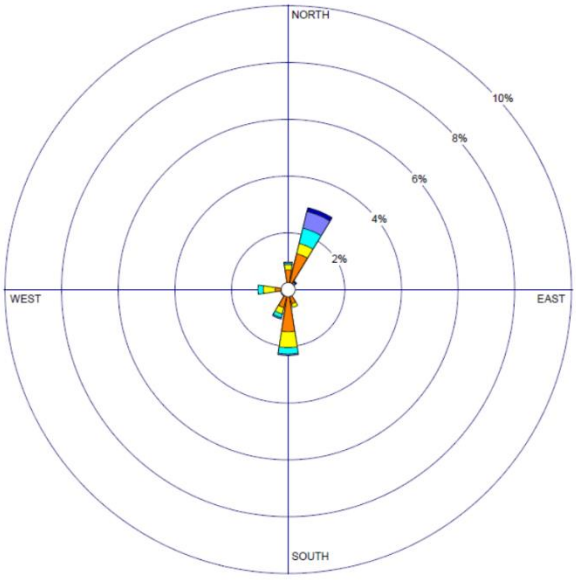
January



February



March



April

Windspeed scale