

## **APPENDIX E**

### **BECA Response to Mr Lapwood's Written Evidence**



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New Zealand

18 November 2018

**Attention: Kathy Mason**

Dear Kathy

### **Response to Mr Lapwood's written evidence for Project Martha**

I have prepared the following information in response to the request from the Project Martha Hearings Panel for a response to the written evidence presented by Mr Lapwood.

## **1 Plume Rise**

Mr Lapwood is correct to say that plumes from sources of air discharges rise into the atmosphere as a result of their vertical momentum and also due to the thermal buoyancy of the gas, where there is a difference in temperature between the exhaust gas and the ambient air. Vertical momentum can be provided to point source discharges, such as vents, by fans and for fugitive discharges such as unconsolidated surfaces by mechanical disturbances from wind and vehicles. The distance a plume will rise into the atmosphere is also influenced by the local terrain, meteorology and any nearby structures, which can reduce the height to which a plume will rise.

Mr Lapwood is also correct to say that smaller particles will remain suspended in the air for longer periods than larger particles.

As a plume travels through the atmosphere, the contaminants in the plume become mixed with the atmosphere and the contaminants gradually disperse and become diluted, and as this mixing process occurs, the concentration of the contaminants in the plume decreases. Consequently, in most circumstances, the ground level concentration of contaminants, where people are likely to be exposed, decreases steadily with distance from the source. In some circumstances, the peak ground level concentration of contaminants may occur at some distance from the source, but this is usually the case only for discharges from tall stacks with high vertical momentum. This is not the case for the vent shafts at Project Martha, or for the fugitive discharges from the pit. I expect the maximum ground level concentration of contaminants from the mine, including fine particulate matter, to occur in close proximity to the source.

The results of the ambient monitoring of total suspended particulate matter (TSP), (which includes the fine particulate matter fraction), carried out by OGNZL and described in Section 6.2.5 of Appendix L of the consent application, clearly demonstrates that the highest concentrations of TSP are measured at the monitoring sites that are closest to the mine and that at more remote locations (between 150m to 250m from the mine), the concentrations of TSP are indistinguishable from background concentrations.

Mr Rolfe, in his assessment prepared for the Golden Link Project Area (attached as Appendix A to Appendix L of the application), modelled the dispersion of the discharges to air from the Correnso vent shaft. The dispersion modelling that Mr Rolfe carried out, took into account the vertical momentum and thermal buoyancy of the plume from the vent shaft and assessed the worst case atmospheric conditions for

dispersion of a point source discharge. Mr Rolfe's modelling results demonstrated that the maximum ground level concentrations of all pollutants, at all locations downwind of the vent shaft, were significantly less than the relevant health-based criteria (refer paragraphs 54 to 57 of Mr Rolfe's report). I also expect that the concentration of contaminants discharged from the vents proposed for Project Martha, in areas where people are likely to be exposed, will be well below the relevant guideline values.

## **2 Air Quality Monitors**

Mr Lapwood has submitted that the discharges to air, of fine particles from the mine, will not be measured by the air quality monitoring network around the mine as the monitors are, in his opinion, located too close to the mine. As noted above, I expect the concentration of contaminants in the discharges to air from the mine to decrease with distance from the mine. The current monitoring sites are located in areas where people live and work and are also located downwind of the mine in the prevailing and secondary wind conditions. They are therefore well-placed to measure the actual exposure of the community to the discharges from the mine.

## **3 Emission Testing of Vent Plumes**

Mr Lapwood submits that the emissions from the vent stacks should be monitored. OGNZL measured the discharges from the Favona vent shaft in 2007 and has agreed to repeat the monitoring as recommended by WRC.

## **4 Fine Particulate Monitoring**

Mr Lapwood submits that OGNZL has not monitored respirable crystalline silica (RCS) "*in the fine range, i.e less than 2.5 microns*".

OGNZL measured ambient concentrations of RCS and particulate matter that is less than 10 microns ( $\mu\text{m}$ ), which is also commonly referred to as "fine particulate" or  $\text{PM}_{10}$ , every two years for periods of approximately four months up until the end of 2014. The results of this monitoring are discussed on pages 41 and 42 and Table 6-6 of Appendix L.

The method used to monitor  $\text{PM}_{10}$  and RCS measures all particle sizes less than 10  $\mu\text{m}$  in size, including particles that are less than 2.5  $\mu\text{m}$ , which are the particles that are able to be respired deep into the lungs. The RCS monitoring results reported by OGNZL are therefore likely to overestimate the ambient concentration of crystalline silica particles that are in the respirable size range, as the results include a fraction of particles that are larger than the respirable size range (ie greater than  $\text{PM}_{2.5}$ ).

The monitoring carried out by OGNZL for  $\text{PM}_{10}$  and RCS is therefore consistent with the current consent conditions and will provide a reliable and conservative measure of the ambient concentrations of RCS in the vicinity of the mine.

## 5 Atmospheric Mixing Height

Mr Lapwood is correct, there is a degree of uncertainty in the calculation of atmospheric mixing heights. However, the level of uncertainty does not generally have a significant effect on the maximum predicted contaminant concentrations. Discharges from ground level or near ground level, such as those located at the mine, are less sensitive to such variations in mixing in height.

Yours sincerely

A handwritten signature in blue ink that reads "Prue Harwood". The signature is written in a cursive, flowing style.

**Prue Harwood**

Senior Associate - Environmental Engineering/Acting Branch Manager

on behalf of

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