

4 May 2017

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Dear Dan

GBC Winstone Otaki Quarry - Silica Assessment

AECOM New Zealand Ltd (AECOM) was engaged by GBC Winstone (Winstone) to undertake a risk assessment of silica from its operations at Otaki Quarry. This letter presents observations from a site visit, a review of site dust management practices, and a silica risk assessment.

1.0 Site Visit and Review of Current Dust Management Practices

On 11 April 2017, an AECOM staff member visited the site to observe various quarrying processes and determine if the mitigation measures provided in the site's Dust Management Plan (DMP) are being correctly implemented and if there is the potential for further improvement to existing mitigation measures.

1.1 Meteorological Conditions

In the four days prior to the site visit and including the day of the visit there had been no rainfall, and the area surrounding the quarry appeared to be dry, which assisted identifying potential dust issues. However, the wind conditions during the visit were calm which reduced the potential for dust discharges to be observed.

1.2 Review of Site Dust Management Plan

AECOM has reviewed the current version of the site DMP and considers that it incorporates a number of best practice technologies and management practices, and represents the mitigation and management practices currently implemented and observed at the site

1.3 Fixed Processing Plant

Minimal dust emissions were observed from the fixed processing plant during the site visit. A water spray system was operated throughout the various screens and crushing activities, this appeared to be suppressing any potential dust emission. This is shown in Figures 1 and 2.

Unprocessed rock being loaded into the fixed processing plant was generally in a damp state, this was due to the source of the quarried material. No dust emission was visible during the loading of unprocessed rock into the main hopper. However it was noticed that when multiple loaders were working in the crusher area, a small amount of dust was generated from the vehicle movements, although this appeared to not be causing any off-site effects.

Figure 1 Crusher plant operating



Figure 2 Water sprayer on the conveyer belt



1.4 Material Extraction

No dust emission was observed from the extraction of material from Ashford Park Quarry. There was pooling water within the pit and the material being extracted appeared to be in a damp condition. Figure 3 shows material being extracted from Ashford Park.

Figure 3 Ashford Park Quarry



1.5 Haul Roads

The haul roads were observed to be in good condition, and had recently been graded, this is usually done 1 to 2 times per month depending on the condition of the road. Generally no visible dust was observed from quarry vehicles as they travelled along the haul roads, however when a truck pulled into the shoulder of the road to allow another vehicle to get past, a small amount of dust was generated. A water cart was in operation and appeared to apply an adequate amount of water to the surface of the roads. This can be seen in Figure 4. All vehicles operating on the haul roads appeared to be complying with the site speed limit of 30 kph.

Figure 4 Water cart in operation



1.6 Stockpiles

No visible dust emissions were observed from any of the stockpiles. The material comes out of the crushing plant quite damp before being stockpiled, however there is the potential for this material to dry out if it is stored for extended periods of time. There is no sprinkler or hose system around the stockpiles that is used to maintain the material in a damp state.

1.7 Overburden Removal

No overburden was removed at the time of the audit so no assessment can be made of the specific dust mitigation measures used. However bunds formed from previous overburden removal were well vegetated, and therefore mitigating any dust emission.

1.8 Dust Tracking

Wheel tracks created by trucks were observed to extend along the merging section with State Highway 1. Once this material dries it has the potential to cause dust discharges through wind erosion or from other vehicles travelling over it.

1.9 Summary of Observations

Generally it is AECOM's view based on the conditions at the time of the site visit, that there appears to be minimal dust discharges from quarry operations, with the exception of some material being tracked out onto State Highway 1. The potential for dust nuisance is currently being controlled through the effective use of dust mitigation measures onsite. The site visit also found that operations at the quarry were conducted in accordance with the site DMP.

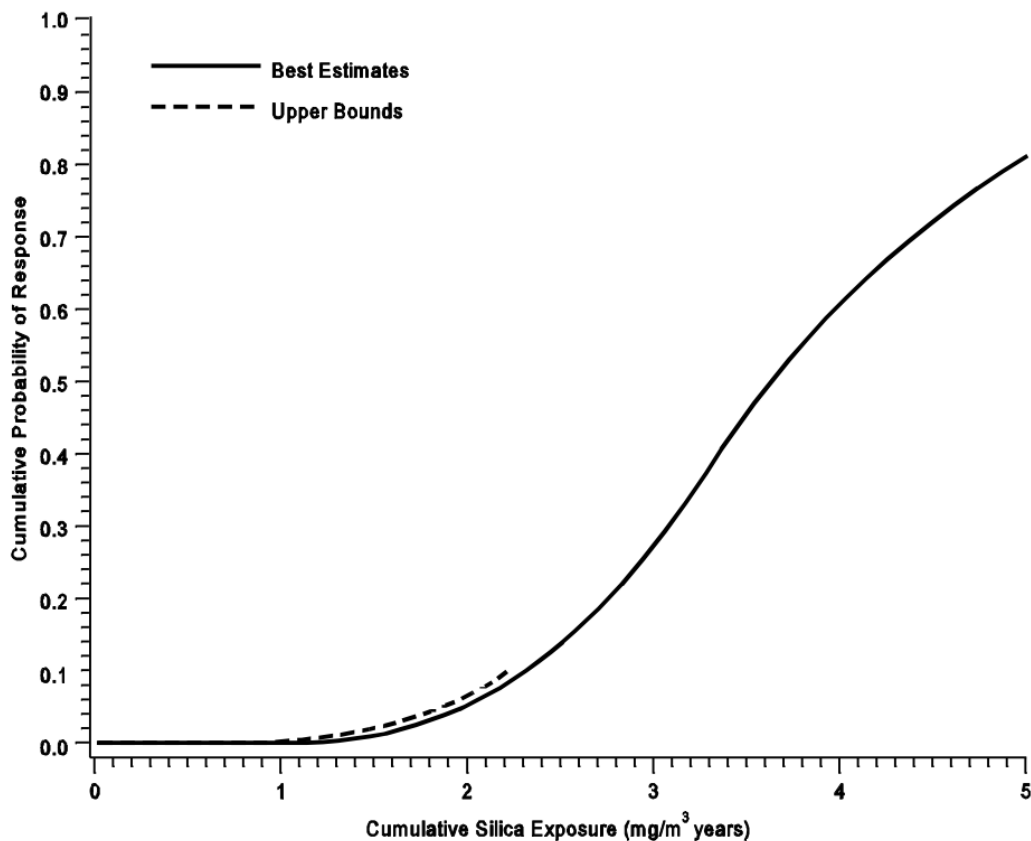
2.0 Silica Risk Assessment

There is no New Zealand standard or guidelines for ambient concentrations of silica; therefore AECOM has considered how silica has been assessed in other jurisdictions. As there has been no ambient monitoring of silica at Otaki Quarry, AECOM has undertaken a risk assessment using a methodology developed by the United States Environmental Protection Agency(US EPA) ¹, to determine the potential risk associated with ambient levels of crystalline silica.

The US EPA has carried out an extensive review of all the available monitoring and epidemiology in the United States and overseas, and as a result has been able to produce a methodology to assess the potential risk to the community of exposure to silica. This review included monitoring undertaken in communities located around quarries. While this data is primarily from the United States, AECOM considers that the methodology that has been used can be applied to this case to assess the risk to people located in the community around the Otaki Quarry.

Figure 5 below presents the results of the US EPA research in terms of potential risk from exposure. As can be seen the data indicates that there is a threshold exposure level of approximately 1 mg/m³ years below which there is no increase in risk of developing silicosis.

Figure 5 Cumulative Silicosis Risk from, Ambient Levels and Noncancer Health Effects of Inhaled Crystalline and Amorphous Silica: Health Issue Assessment , US EPA



1 United States Environmental Protection Agency, Ambient Levels and Noncancer Health Effects of Inhaled Crystalline and Amorphous Silica: Health Issue Assessment, November 1996, EPA/600/R-95/115

Using the US EPA methodology AECOM carried out an assessment of the potential risk to people living in the vicinity of the quarry. One of the difficulties that are encountered in an assessment of this type is the question of appropriate variables. To ensure that our assessment has taken into account all the known risks, AECOM has used the most conservative input data that we have been able to identify. This input data includes; monitoring that AECOM has undertaken at other Winstone Quarries (Hunua, Belmont and Otaika), historical background data from monitoring undertaken within Otaki township, as well as short-term ambient monitoring carried out on the day of the site visit at Otaki Quarry. Table 1 summarises the results of that assessment, based on monitoring data available.

Table 1 Estimated Risk of Silicosis

Scenario	Average Ambient PM ₁₀ (µg/m ³)	Percentage Silica ²	Exposure (mg/m ³ years) ³	Risk Score ⁴
Otaki Quarry (short term)	15	30	0.882	0
Otaki Background ⁵	14	30	0.823	0
Other Winstone Quarries (TSP Data) ⁶	14	30	0.823	0

As can be seen from the data presented in Table 1, there is no additional risk to individuals living in the area around the quarry of developing silicosis, as exposure is below 1 mg/m³ years. AECOM notes that the particulate concentration used from other Winstone quarries is total suspended particulate data, and is likely to be an overestimate of the actual PM₁₀ averages experienced in the area. Also any actual exposure is likely to be considerably less than that used in the risk assessment which is based on the standard exposure of 70 years.

Based on this assessment AECOM does not consider that there is any significant additional risk for people currently living near to the quarry to contract silicosis. However the silica content of 30 percent at Otaki Quarry is significantly higher than other quarries (7-14 percent), and if there is an increase in dust concentration (by more than 5 µg/m³) the risk increases, and specific silica monitoring is recommended.

Yours faithfully



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² Silica content for material from Otaki Quarry, as supplied by Winstones

³ Based on calculation set out in United States Environmental Protection Agency, Ambient Levels and Noncancer Health Effects of Inhaled Crystalline and Amorphous Silica: Health Issue Assessment, November 1996, EPA/600/R-95/115

⁴ Based on calculation set out in United States Environmental Protection Agency, Ambient Levels and Noncancer Health Effects of Inhaled Crystalline and Amorphous Silica: Health Issue Assessment, November 1996, EPA/600/R-95/115

⁵ Based on monitoring undertaken between 20 July 2011 and 06 February 2012

⁶ Total average TSP concentration data Hunua, Belmont and Otaika quarries