Appendix 21.1

Methodology for the dust assessment

1.1 The IAQM guidance[1] states that '…dust impacts will occur mainly within 400m of the operation, even in the dustiest of sites'. The guidance also states '..if there are relevant human and/or ecological receptors within 250m or 400m (depending on the rock type) then a disamenity dust impact assessment will almost always be required'. For this qualitative dust assessment a conservative assessment has been undertaken and all receptors within 400m of the boundary of the site have been identified and assessed.

1.2 To undertake the qualitative dust assessment the scale and nature of the works is considered to determine the residual source of dust emissions during site preparation and restoration, mineral extraction, cell preparation, materials handling including waste disposal, on site transportation, waste processing, stockpiles and exposed surfaces together with vehicles entering and leaving the site in accordance with Appendix 4 of the IAQM guidance. The residual source emissions are the potential emissions without any operational controls.

1.3 The methodology for determining the magnitude of residual source emissions is established through an assessment of a number of factors and the determination of whether the activities have a large potential dust magnitude or a small potential dust magnitude. The items that are considered are:

Activity	**Large potential dust magnitude**	**Small potential dust magnitude**
Site preparation/ Restoration	Large working area High bunds High volume of material movement.	Small working area Low bunds Low volume of material movement

[1] Institute of Air Quality Management (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning v1.1

Activity	Large potential dust magnitude	Small potential dust magnitude
	High numbers of heavy plant Minimal seeding/sealing of bund surface. Material of high dust potential	Low numbers of heavy plant Bunds seeded/sealed immediately Material of low dust potential
Mineral extraction	Large working area High energy extraction methods. Material of high dust potential High extraction rate.	Small working area Low energy extraction methods Material of low dust potential Low extraction rate
Materials handling	High numbers of. heavy plant Unconsolidated/bare surface Activities close to site boundary Material of high dust potential	Low numbers of heavy plant Hard standing surface Activities within quarry void Material of low dust potential
On site transportation	Use of unconsolidated haul roads Unpaved haul roads Road surface of high dust potential High number of heavy duty vehicle movements High total length of haul roads	Use of conveyors Paved haul roads Road surface of low dust potential Low number of heavy duty vehicle movements Low total length of haul roads

Activity	Large potential dust magnitude	Small potential dust magnitude
	Uncontrolled vehicle speed	Controlled (low) vehicle speed
Material processing	Raw material of high dust potential End product of high dust potential Complex or combination of processes High volume material processed	Raw material of low dust potential End product of low dust potential Single process Low volume material processed
Stockpiles/Exposed surfaces	Long term stockpile Frequent material transfers Materials of high dust potential Ground surface unconsolidated Stockpiles close to site boundary Large areas of exposed surfaces High wind speeds/low dust threshold	Short term stockpile Infrequent material transfers Materials of low dust potential Ground surface hardstanding /clean Stockpiles well within quarry void Small areas of exposed surfaces Low wind speeds/high dust threshold
Vehicles leaving the site	High number of heavy duty vehicle movements Unconsolidated access road	Low number of heavy duty vehicle movements Paved access road

Activity	Large potential dust magnitude	Small potential dust magnitude
	Limited/no vehicle cleaning facilities Small length of access road	Extensive vehicle cleaning facilities Large length of access road

1.4 To have an impact dust must be carried from the source to a sensitive receptor which is dependent on wind speed and direction together with the location of the receptors. The proximity of the receptors based on distance from the source have been categorised using Table A3-3 of the IAQM Guidance. The distance to each identified receptor has been measured from the closest point of the application boundary to provide a conservative assessment and each receptor has been categorised based on the categorisation set out below.

Category	Criteria
Distant	Receptor is between 200m and 400m from the dust source
Intermediate	Receptor is between 100m and 200m from the dust source
Close	Receptor is less than 100m from the dust source

1.5 The frequency of winds with the potential to generate dust has been categorised using the parameters presented below from Table A3-2 of the IAQM Guidance. The dry hours windrose provides a summary of the wind speed and direction in the hours in which rainfall is less than 0.2mm (Appendix 21.3). The frequency of winds with dust generating potential has been categorised in accordance the guidance as set out below.

Frequency Category	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	The frequency winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

1.6 The effectiveness of the transfer of dust through the air (pathway effectiveness) without the implementation of any control measures is then determined based on the guidance in the table set out below.

		Frequency of potentially dusty winds			
		Infrequent	**Moderately frequent**	**Frequent**	**Very frequent**
Receptor Distance Category	**Close**	Ineffective	Moderately Effective	Highly Effective	Highly Effective
	Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
	Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective

1.7 The estimation of the risk of impacts from dust without the implementation of any control measures is determined using the pathway effectiveness together with the residual source emissions using the categorisation set out below. The residual source emissions are estimated using the parameters set in the guidance and provide an estimate of the potential for the emission of dust without any operational controls in place. As the site would not be permitted to operate without dust control measures, these residual source emission categories are not representative of the potential for dust emissions at the operational site.

		Residual Source Emissions		
		Small	**Medium**	**Large**
Pathway Effectiveness	**Highly effective pathway**	Low Risk	Medium Risk	High Risk
	Moderately effective pathway	Negligible Risk	Low Risk	Medium Risk
	Ineffective pathway	Negligible Risk	Negligible Risk	Low Risk

1.8 Based on the types of receptors identified the sensitivity of the receptors are categorised in accordance with Box 4 on Page 24 of the IAQM Guidance as shown below. The sensitivities assumed are based on whether or not the receptor is likely to be exposed to dust over a 24 hour period.

High sensitivity receptor

- Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).

- Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

Medium sensitivity receptor

- Locations where people are occupationally exposed over a full working day.
- Indicative examples include offices, warehouses and industrial units.

Low sensitivity receptor

- Locations where human exposure is transient.
- Indicative examples include public footpaths, playing fields, parks and shopping streets.

1.9 The magnitude of dust effect without the implementation of any control measures is then determined based on the dust impact risk and receptor sensitivity based on the guidance given in the table below.

	Receptor sensitivity		
	Low	**Medium**	**High**
High Risk	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk	Negligible Effect	Negligible Risk	Low Risk
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

1.10 Professional judgement is then applied to estimate the overall potential disamenity dust effect on the surrounding area taking into account the number and location of

receptors and the magnitude of dust effect likely at each receptor. A conclusion is then reached on the likely significance of the effect of dust on amenity.