
ELLAND EDGE QUARRY

Dust Management Plan

For

Rand & Asquith

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DUST ACTION PLAN FOR THE CONTINUATION OF QUARRYING AND RESTORATION WITH RECOVERED WASTE TO FILL THE EASTSIDE VOID AT ELLAND EDGE QUARRY

1 Introduction

Samuel Gledhill & Sons Limited, the owner of the quarry have agreed with Rand & Asquith (AceBlade) Ltd, the quarry operator to submit a permit application for the recovery of waste to build a buttress against the east and north side faces for a haul road and fill against the mineral waste tip and backfill the void space with imported inert waste or waste that has been tested under WAC criteria as acceptable under a Standard Rules 2015 number 39 Permit. The scheme is to provide a restoration scheme to buttress the mineral waste tip at the south end of the site, provide a haul road into the site and to fill it in 4 phases to the surface at Elland Edge Quarry, Rastrick.

Rand & Asquith are the operators of the quarry, and the void space is in the ownership of Samuel Gledhill and Sons Limited and the company are applying for an Environmental Permit to recover material that is imported to place in the void space that has been created by quarrying stone and shale from the east side. The void is now ready for a recovery operation and the operator has prepared the permit area for infilling as they progress quarrying activities in the west side of the site. The mineral waste tip consists of shale and mudstone excavated during the winning of building stone from the Elland Flag series of sandstone. Please refer to plan number EEQ DUST 1 and the conceptual model drawing number RA/LEQ/CMA – 01 and 02.

This report assesses the potential dust impact of the quarrying and the placement of engineered fill in the eastern section of the of the site as shown coloured light brown on plan number RA/LEQ/JAN21-01. There will be no processing operations of controlled inert waste only material will be deposited.

Sandstone processing operations will be located on the backfilled area to the south where stockpiles are located to shelter the mineral processing operations and reduce the potential for dust arisings. The report makes recommendations on the relevant most appropriate conditions for the continuation of the quarrying operation to the west side and the deposit of inert waste to build the haul road on the east side in recovered waste and then fill the east side in to the surface. In particular the effect the filling operations could have on the local residents. The permit area is shown on plan number RA/LEQ/WML 22-02.

The deposit of imported waste for recovery will be on the east side of the site, from the crest of the minerals tip and near the stockpiles, which is over 250 metres from the houses on Low Edge Road. There has been an extension area in the northeast corner of the site to the quarry of approximately 7500 square metres in area, granted for the winning and working of building stone and shown in the four fields on plan number EEQ/DUST 1. The quarry produces approximately 50,000 tonnes of stone products, including flag stone, walling stone,

ashlar stone and aggregates, each year. The void space shown on plan number RA/LEQ/WML/22-02 will provide 263,000 cubic metres or 500,000 tonnes for the facility and will take about 5 years to complete.

It is proposed to import 100,000 tonnes of imported waste per annum and of that, all will be used in the filling of the void in layers across the permit area shown on the plan RA/LEQ/WML 22-01. The coarse material will be used for the haul road shown on plan number RA/LEQ/REC16-04 into the site and drainage material against the faces whilst the fines will be compacted in layers as earthworks.

Imported excavation material that is fine that can be used for the restoration will be placed in layers and compacted.

The quarry was granted permission to continue working stone in January 1949 (Ref BR4600) and an application for a determination of conditions to continue quarrying was granted in February 2001. Planning permission has been reviewed several times over the past 20 years so that the operation is controlled by modern planning and environmental conditions. The planning permission was granted with the importation of waste to restore the void where stone had been quarried. The reviewed planning permission has reference number 16/00439/MCO. This dust report deals with the potential emissions from the recovery scheme to buttress mineral working faces on the east side of the quarry. Refer to plan number RA/LEQ/REC 16-04.

Although the quarry extension area was small in relation to the rest of the site which is working as a whole, the quarry workings advanced towards more sensitive receptors and therefore consideration of control measures was needed to avoid the possibility of dust nuisance becoming an issue. The deposit of the recovered waste is in the worked out area of the quarry in the floor and is 36 metres below the surface. The permit area has been engineered from quarry waste once stone extraction has ceased. No other historical waste has been found and the site is now ready to receive recovered material to fill the void.

The recovery scheme will place engineered fill in layers against the faces on the east and north side and the area will be filled with inert waste in the void against the mineral tip slope on the south side. The operation will be below the surface of the site for at least three years before the level is reached where the potential for dust emissions to the local residents could be increased. The inspection and selection of imported material placed in the void has the potential to emit dust unless good management is in place to manage emissions.

Importation of hard coarse material in the void has the potential to cause dust if not dampened down. Selecting concrete, brick and stone from demolition sites for drainage material is very similar to the quarrying activity on site as stone is quarried and then placed in stock for later processing and mineral waste consisting of clay, mudstone and shale is tipped and compacted. The excavation waste brought to site will be the same type of material as the quarry within the exposed coal measures and excavation contracts for development within 25 km radius will be working the same geological sequence. Hard waste will be selected for drainage material against the faces of the quarry as the site void is filled to maintain drainage in the sandstone beds.

For certain quarry processes, dust emissions are controlled under Part I of the Environmental Protection Act (EPA) 1990 and its successor, the Pollution Prevention and Control Act 1999 and the Pollution Prevention and Control (England and Wales) Regulations 2000 (the PPC Regulations). Enforcement action to control dust when it amounts to a nuisance can be taken under Part III of the EPA 1990 by the Local Authority. However, the Government expects operators to make proposals that are environmentally acceptable from the outset rather than relying on retrospective action, and MPAs should take due account of this in their decisions on individual applications. MPAs and operators should liaise with the relevant pollution control bodies (i.e. the Environment Agency and Local Authority (LA) Environmental Health Departments) in considering and making decisions on individual applications.

This report considers the potential of the existing operations at Elland Edge Quarry to generate dust together with the associated nuisance impacts that may occur to sensitive properties and locations as a result of such emissions to air.

The operations would only affect air quality under the following conditions:

- If dusts are released to atmosphere from the site in sufficiently high concentrations; and:-
- If there is insufficient atmospheric dispersion to dilute dust emissions to a concentration that does not have a nuisance or health effect.

If these conditions occur in an area where sensitive receptors (such as residential properties, schools, hospitals etc) are located, then the receptors may experience a nuisance or there is a low risk of adverse respiratory health effects.

Therefore, the significance and resultant impacts of dust emissions to air from the operations are dependent upon the significance of the emissions, the prevailing meteorological conditions for that location, and the proximity of sensitive locations to the emission sources. The potential for these to occur and give rise to health impacts and/or nuisance is assessed.

The assessment has been carried out on a qualitative basis as there are few quantitative standards relating to relevant air quality issues. Furthermore, there is no quantitative data available specific for the site.

The guidance issued by the Environment Agency in the H1 Risk Assessment table 3 for fugitive dust emissions, and the Mayor of London in the publication *The Control of Dust Emissions from Construction and Demolition Sites* have been considered.

2 Concerns about Dust

Dust forms an inherent part of the environment, being dispersed from a variety of natural and anthropogenic sources by wind and water. Therefore, the meteorological conditions in

any locality are of paramount importance when considering the potential for dust dispersal - the most significant cause of dust emission from surface operations being wind blow.

Fugitive dust emissions from surface operations, whether quarrying stone and stockpiling it or placing waste such as concrete and brick for drainage the operations that occur at the Elland Low Edge site, are generally a localised phenomenon and comprise of dust particles in the size range of 0.1 μm to 100 μm , typically averaging 70 μm , and they are produced through the action of crushing and abrasive forces on materials. These larger dust fractions consequently have relatively large settling velocities, resulting in them being deposited over relatively short distances. Quarries and inert waste processing and treatment should not produce dust particles of less than 30 micron so the dust is a nuisance not a health risk. Evidence from research at opencast coal sites, quarries and demolition sites has found the risk to human health to be low from dust emissions from such sites.

Airborne particles cover a wide range of particle sizes and types (e.g. wind blown dust, sea salt aerosols, biological material and secondary particles). In the UK and more recently in Europe, air quality standards and guidelines are related to particles of less than 10 μm in aerodynamic diameter, referred to as PM_{10} . These particles are representative of the large proportion of airborne particulate matter and may have a potential impact on health. Particles of less than $\text{PM}_{2.5}$ are referred to as the fine fraction and are capable of reaching the deepest part of the lung. Particles between $\text{PM}_{2.5}$ and PM_{10} are termed the coarse fraction and are normally deposited in the upper airway. Generally, particles generated from combustion processes and the condensation of vapours fall within the fine fraction ($\text{PM}_{2.5}$) whereas those particles generated from mechanical break up of solids and liquids are within the coarse fraction ($\text{PM}_{2.5}$ and above). These particle sizes are unlikely to be emitted from the operations associated with the placement of engineered materials and screening of the received waste at the site. Most particle sizes will be of the 30 to 70 micron size and will settle over the site where the processing area is located. The placement of waste is in the base of the quarry and will be mitigated by the faces around the site at a higher level and the mineral waste tip until the surface is reached.

Dust Nuisance

The nuisance effects of dust emissions sometimes called dis-amenity dust are related to both emissions of large and fine particles. Deposition of these particles onto surfaces, such as windows and cars, causes soiling that, if sufficiently great, can be considered to be a nuisance. In addition, occasional clouds of dust can cause a visual and sensory nuisance.

Potential Health Effects from Dust

A report by the Quality of Urban Air Review Group (QUARG) provides a discussion on the potential health effects of airborne particles by reference to a detailed review of this issue undertaken by the Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP). It has been well established that people with pre-existing respiratory and/or cardiac disease are more susceptible to acute health effects from exposure to airborne particles. The research was undertaken on behalf of the opencast coal industry from a number of sites working various geological horizons in the coal measures.

There is no convincing evidence that healthy individuals will be significantly affected by ambient levels of particles occurring in the UK from mineral extraction or engineering operations using excavated strata. Furthermore, with regard to the health effects from specific types of particles, the QUARG report states:

'It is unlikely, however, that coarse, wind-blown particles have a significant effect upon health'.

This conclusion is substantiated by research undertaken by the former British Coal Opencast at opencast coal sites in South Wales. This research indicated that levels of PM₁₀ are much the same upwind and downwind of their study sites i.e. that relatively little dust in this size range is produced by this type of development. In addition, work undertaken at Derlwyn Opencast Coal Site over a period of six years which included continuous monitoring of respirable dust using a wide range of the best available instrumentation and techniques concluded that, although some dust had been generated at Derlwyn it was *'barely detectable'* and the possibility of any effect on the health of the local population was *'likely to be remote'*. Although this operation is not an opencast coal mine, the research demonstrates that the impact of surface mineral workings can be minimal with appropriate mitigation measures and effective management.

Further research has been undertaken by the IAQM in 2016 on the effects of dust on the surrounding amenity and environment from mineral working. Whilst the guidance is related to the minerals industry the operations discussed in this recovery operation of placing materials and compacting it are the same as using minerals waste as both have the same physical properties and use the same machinery to achieve the compaction.

The amount of dust generated by each activity depends on the size of particles and, crucially, upon their moisture content. Dust emissions are greatest when there is a plentiful supply of small dry particles.

Dust - defined as all particulates matter up to 75 µm in diameter (according to BS6069) and comprising both suspended and deposited dust

PM10 - A mass fraction of airborne particles with an aerodynamic diameter of 10 microns or less. It is comprised of *coarse* particles (2.5-10 µm in diameter), which are primarily from non-combustion sources and *fine* particles (less than 2.5 µm), which includes combustion processes or are formed in the atmosphere through the chemical reaction of primary emissions of gases.

Particulate matter includes a wide range of sizes and types of particles and will vary in composition from place to place and time to time.

Most dust particles from quarrying and excavation work are too big to be inhaled but can cause eye, nose and throat irritation and lead to deposition on cars, windows and property. PM₁₀ is of more concern to human health as the particles can enter the lungs, causing breathing and respiratory problems, with long-term health effects dominated by cardiovascular rather than respiratory problems. The PM₁₀ size fraction is associated with a

range of effects on health including respiratory and cardiovascular systems (ie asthma) and mortality (deaths brought forward). Particles can also carry adhered carcinogenic compounds into the lungs. The most vulnerable people are the elderly, the very young and those with existing heart and lung conditions.

The detrimental health impacts of PM₁₀ are not confined to the construction site. These particles can travel further than coarser dust and so can affect the health of people living and working in the surrounding area of the site.

PM₁₀ levels are associated with the combustion of fossil fuels and are mainly caused through diesel engines not operating at the optimum operating condition. Emissions are caused in slow and congested traffic and poorly maintained engines. This is not the case on quarry sites as most plant is well maintained, and the trucks can deliver material to the point of use without queueing or having to move in slow traffic on site.

3 Public Perception

Dust effects on people have been identified as arising from increases in airborne dust concentrations, and deposition levels. Dust deposition on windows, the outside of houses and cars are the most frequently mentioned reasons for concern. The perception of dust from surface soiling is determined by a number of factors:

- deposition on a surface which is usually expected to remain free from dust;
- the colour contrast between the deposited dust and the surface upon which it settles;
- the nature of the illumination of the surface – ‘dinginess’;
- the presence of a nearby clean ‘reference’ surface against which comparisons may be made;
- the identity of the area and the composition of the local community;
- social factors, such as lifestyle and patterns of working;
- the personal experiences and expectations of the observer; and
- adverse publicity influencing the expectations of the observer.

The rate of deposition and therefore the time taken for dust deposition to become visible also influences the perception of dust. Rates of deposition vary widely with emissions, variations in wind speed and direction, and also variations in the background dust concentration. These background levels will determine the reaction of local people to any additional dust from specific mineral sources, together with the following two factors:

- the frequency of dust deposition incidents – a community may be prepared to tolerate an incident once a month, but not repeated incidents at frequencies of one or twice a week,
- the area affected by deposition – the larger the emissions, the larger the area affected and thus the greater the probability of activating a complaint.

4 Current Regulations

As previously stated, the amount of dust that might cause a potential nuisance is extremely difficult to determine. Similarly, numerous attempts have been made at identifying a nuisance standard for dust, without success. A number of non-statutory standards are used as a guide for the assessment of nuisance, including the concept of dinginess developed by Carey (1959), Shillito (1978), and Beaman and Kingsbury (1984).

National Planning Policy Framework and the National Planning Policy on Waste for England

Controlling and Mitigating the Environmental Effects of Minerals Extraction in England was a planning statement of the policy considerations in relation to dust from mineral workings and associated operations, and how they should be dealt with in local development frameworks and in considering individual applications.

This guidance has been superseded by the Technical Guidance Note that accompanies the National Planning Policy Framework published in July 2021. However, the guidance given in MPS 2 is still applicable due to the research undertaken to compile the document and the detailed methods discussed of controlling dust emissions and air quality.

Appendices briefly outline information on the nature of dust, give examples of methods of reducing and controlling dust, and outline good practice in dust assessment. The Government expects Mineral Planning Authorities (MPAs) in England to have regard to the guidance in the online technical guidance, good practice and advice issued by learned bodies alongside the policies contained in the NPPF overarching document.

Furthermore, and as documented by MPS 2, a Department of Health (DoH) and (former) DETR report on the impact of particles from opencast coalmines concluded that:

‘Opencast coalmining was associated with a small increase in the mean concentration of airborne particles measured as PM₁₀ in areas close to opencast sites.’

A quarry and backfilling with material can be taken to be the same type of operation as opencast coal mines albeit on a much smaller scale. It can also be compared with the processing of demolition waste and guidance provided in the Greater London Council publication on the “Control of dust and emissions from construction and demolition” Best Practice Guidance dated November 2006.

Currently, there are no statutory or recommended levels of dust deposition that may constitute an official nuisance. It is normally left to the local Environment Health Officer, under Part III Section 791(d) of the Environmental Protection Act, to determine if, in his opinion, a statutory nuisance exists.

Planning permissions incorporate several conditions for the minimisation of dust emissions, and these are generally based on the principle of the Best Practical Environment Option

(BPEO) appropriate to the site under consideration. The best options are avoidance of dust and then to mitigate the emissions, through choice of good machinery, spray bars on conveyors on the screening equipment and location on site.

The type of material brought to the site under this proposed recovery scheme is very similar if not the same as the mineral operations. This dust assessment has been reviewed and updated the dust report approved by the Council when reviewing the minerals permission with the import of inert materials to restore the site.

5 Description of the Site and Operations

The quarry is situated adjacent to and on the south side of Lower Edge Road and consists of a quarry entrance, which accesses the current stone processing area. A stand of trees of various species lies parallel to the roadside. This belt of trees is now well established and screen the majority of the quarry from Lower Edge Road the exception being the temporary stockpiles of waste stone and overburden materials located to the south side of the quarry and denoted as stockpile on coloured light brown on plan number RA/LEQ/JAN21-01.

The current quarry workings are situated along the western side of the permit area being applied for with the mineral waste tipping to the south of the quarry void. On the southern side can be found the waste stone stocking area awaiting processing in to aggregates. In the future the area may also be used to process hard demolition waste imported to site under a Standard Rules Permit but planning permission to process waste will have to be granted.

To the west is the Elland Flag stone dressing/processing area which is at the northwest corner of the site. The area for the quarry lies to the west of the void that is now proposed as the permit site and workings are progressing towards the southwestern boundary under the existing planning permissions. The quarrying activity in this area is likely to carry on from 2021 to 2029.

Storage of finished paving products is located in the northwest corner of the site adjacent to the site entrance.

The southern part of the site has had all of the sandstone reserves extracted and is currently being infilled with mineral waste and the buttress has been placed against the mineral waste tip to provide support for the tip and allow various levels off the slope to fill areas in the void with inert waste delivered to the point of use. The infilling area is located in the central east section of the quarry at floor level, 141 metres aod and will be built up to a level of 176 metres aod. For most of the time the recovery operation will be below ground until the final 5 metres of waste is placed near to the surface.

The dimension stone, flag rock and ashlar stone are extracted and processed on site at the quarry or transported to Tuck Royd works. All of the flag rock is dressed on site and waste stone not suitable for sawing or producing paving is placed on the stone stockpile to be processed into aggregates.

Overburden stacks are positioned at the south of the site by the haul road from the entrance along with the crushing and screening plant which is positioned in the southeast corner of

site and will be outside the permit area. There will be no processing of imported waste. The aggregate processing will take place in the south side of the quarry outside the permit area which is the furthest point from the houses on Low Edge Road.

The placing of imported waste in layers and compacting with machinery will be separate from the stone quarry operations as the quarry operation has progressed into the restoration stage on the east side. The piles of treated inert waste will be located and clearly marked as clay or drainage material within the permit area and quarried stone product will be marked as primary aggregate or stored outwith of the permit area shown on plan number RA/LEQ/JAN21-01

The quarry area gently rises from a level of 160 metres A.O.D. at its northern boundary, adjacent to Lower Edge Road, to 176 metres A.O.D. at the southern boundary fence.

The quarry site covers a total area of approximately 9.4 Ha and lies on a plateau of Elland Flag rock to the south of the Calder Valley and Elland. The quarry is on the axis of the hill which rises from the town of Rastrick along Lower Edge Road. The permit area is centrally located in the east side of the quarry west of the mineral extraction area. Refer to plan number RA/LEQ/WML/22-01.

The site is bordered by residential dwellings to the north and east with a school (Highbury School) approximately 350 metres to the east of the quarry boundary. The majority of this residential development has taken place since the 1960's. New housing is being built on New Hey Road over the next three years and this development will require a facility to take material that has been excavated for the foundations and roads. If the permit is issued this material from the housing development could be taken straight to the quarry without going onto the public highway.

Immediately to the west of the site boundary can be found Church Lane and the residential dwellings that are situated along it. These dwellings have been in existence since approximately the beginning of the 1900's.

To the south of the site are agricultural fields and these fields extend to Dewsbury Road which has had houses built along its length. Between the Dewsbury Road and the M62 motorway is pasture. To the south beyond the M62 motorway is the Ainley Top to Brighouse, the road known as New Hey Road and the land then rises steeply up to Upper Cote Farm on Fixby Ridge.

To the west is a steep escarpment off the plateau of Elland Flag Rock, which falls steeply into the valley bottom and the main route from junction 25 off the M62 motorway which connects to Elland and Halifax along Calderdale Way.

To the north of the site located in the southern valley side of the Calder Valley is the workings for brickclay minerals to supply the Hanson Brick Factory in Cromwell Bottom. The brickclay reserves are excavated from an area known as Strangstry Wood. Refer to plan number Figure 01 / 2010.

Plateaux of Elland Flag Rock exist to the north of the Calder Valley at a similar elevation as that noted at Elland Edge quarry. These plateaux of rock can be found at Southowram and Hipperholme.

The quarry has won and processed stone on site for over 20 years and there have been few complaints of dust emissions to the local residential properties on Lower Edge Road and Church Lane.

With the quarry the overburden and beds of mud stone in between the beds of sandstone have been excavated in layers and then transported to the tipping area on the south side of the quarry to fill in previous voids for over 20 years.

The inert excavation material accepted to site under this recovery activity is very similar in terms of properties and petrographic analysis in that it will be excavation waste from the Coal Measures Strata and fines from the screening of demolition waste. The fines from the the recovered waste will be used in the compaction of the material in the void to support the exposed faces and buttress the tip so it is usually damp to obtain the optimum moisture content.

Consequently, the potential for dust emissions can be assessed from the quarrying operations as the two processes are very similar and dust emissions from the plant are the same. If the source of dust has to be ascertained, then the particles can be analysed by electron microscopy. The permit holder will need to know however so the operation can be adjusted to reduce the nuisance dust emissions. Details of the composition of the dust is important but is unlikely to be of interest to the receptors as the source will not matter to the residents if there is nuisance dust from the quarry, they will think it is all the same.

6 Assessment of Potential Dust Generating Activities

The amount of dust generated and emitted from a surface operation and its impact varies with respect to:

- (a) The type of working
- (b) The types of processing activities
- (c) The character and composition of the surrounding area
- (d) Climate and topography

The operations at Elland Edge Quarry have been examined for the particular site and they are as follows;

- i) The excavation of stone from the quarry face,
- ii) The hand cutting of stone
- iii) The loading of slabs on to road borne vehicles and transportation off site
- iv) The processing of stone through the mobile crusher
- iv) The loading of the crushed stone into tipper trucks by a front-end loader.
- v) The haulage of the product off site
- vi) The tipping of overburden,

- vii) The importation of engineering material to fill the void and the selection of hard material such as concrete and brick for drainage material. The tipping of imported waste by tipper truck on to the level in the void within the permit area for deposit and compaction.

All the above activities will continue through the life of the site and will have a potential to cause dust emissions. The waste import and placement of suitable recovered waste will take place for approximately 5 years.

The potential for dust generation is a function of the speed of vehicles the degradability of the surface and the wind speed, which in this case is thought to be minimal. The Elland Edge site is relatively small and the site haulage plant slow moving. The haul roads will be covered with coarse material from the selection operation and concrete and brick will be used to dress the roads within the permit area from the access to the tipping area.

The potential for dust generation from the tipping out of recovered waste from tipper trucks and the processing of the material through a crusher is moderate if good practice is incorporated into the operations. The processing and stockpiling of recovered waste and the potential for dust generation will also be affected by the siting of the processing area.

The crushing of the waste to coarse aggregate and the screening of fines could cause dust and this is usually seen where the product drops off the end of the conveyor onto the stockpiles. The fines are blown out of the product especially if the weather is windy. To counteract this, the belts can be covered with shrouds and water sprays fitted. The height that the material is dropped onto the pile will be kept to a minimum from the end of the conveyor.

The most effective way of minimising emissions of dust out of the site is to place the imported waste on a lower level than the surrounding properties. The operation is then offered some protection from the elements by being shielded by the quarry faces or the screening bunds. Any dust generated will generally travel in the direction of the wind horizontally and will coat the quarry face rather than travel outside the site.

The processing of sandstone from the quarry for aggregates will be situated in the south side and stockpiled in this area before being loaded into the dumper to be taken to the stockpile area for loading into road going wagons. Wagons delivering inert materials to restore the quarry will be used, if possible, to deliver aggregates from the quarry thereby have full loads in and out of the site. Excavation and demolition waste will be delivered direct to the permit area after inspection and waste acceptance procedures have been followed to ensure it is inert and a soil type material.

The inert waste delivered to site will be inspected and delivered by truck to the point of use within the permit area. If weather conditions are unsuitable for road going wagons to deliver inert material to the point of use then it will be loaded direct into a dumper by front end loader for the dumper to take to the location and level. The material arriving at site which is suitable for direct emplacement is brought in by tipper trucks hence the need to use hard waste such as concrete and brick from demolition rubble to surface the internal roads within

the permit area. Most wagons are now fitted with a sheet roller called “easi-sheet” that retracts and pulls out as required which will minimise dust emissions from the operation.

The main cause of dust is the degradation of the running road on the buttress and the peripheral haul road as the clay is ground so in dry weather can become a powder so a top layer of rubble will reduce this risk of powdery material becoming airborne. The road area will be regularly sprayed in periods of dry weather and cleaned up and graded on a regular basis with good aggregate.

The delivered hard waste that requires separation can be tipped in a bund within the permit area on the level being laid and used on the roads and for drainage against the face and slope on the quarry tip. It will be stored below the surface level to reduce the risk of dust blow.

The sandstone processing area to the south of the permit area will be surrounded by an edge protection bund 3 metres high and 8 metres wide so the aggregate operation is screened from the houses and quarry frontage. The bund will separate the permit area from the quarry operation will offer some mitigation from dust blow off the crusher and screen in periods of dry weather longer than three days.

7. Site Sensitivity

The three main factors which potentially affect the sensitivity of the site with regard to dust are:

- The distance of inhabited areas from site activities
- The location of the inhabited areas relative to the prevailing winds
- The density of habitation

The most critical element in the consideration of the potential for a dust nuisance to be caused is the direction of the prevailing winds. The general prevailing winds in the UK are south westerlies (blowing from the southwest to the northeast). To determine the sensitivity of the surrounding area, the location of residential areas to the site activities must be examined.

The meteorological data from Bramham, West Yorkshire Weather Station has been analysed to quantify the number of dry working days in which the wind direction is in a particular sector.

Information provided by the Met Office as monitored at Bramham, West Yorkshire is detailed in table below:-

Wind Direction	Frequency of Occurrence %
North	4.7
North North East	3.6
East North East	3.4
East	4.2
East South East	6.3
South South East	10.1
South	8.4
South South West	12
West South West	13.5
West	16.6
West North West	6.8
North North West	8.4
Calm/Variable	2.1

The location plan appended to this report shows the relationship of the centre of the activities on the site at Elland Edge quarry, in relation to the two zones of influence, generally recognised as being those affected by dust blow from the mineral activity and the recovery scheme, refer to plan EEQ/DUST1. This plan indicates that there are properties to the west, northwest, north, northeast and east of the site area, which lie within the potentially sensitive zone of 250m. There are further residential areas within the second slightly sensitive zone of 500m, which lie to the northeast of the site.

The potential for dust emissions is greater from the recovery operation now that the quarrying of stone has ceased in the permit area as it is closer to the houses and frontage land and also activity can be near the surface as the overburden is placed over the inert waste as the layers near the surrounding surface. A screen bund of topsoil has been placed around the boundary, shown coloured green on plan number RA/LEQ/JAN21-01 which is now vegetated with grass which will mitigate the potential for dust emissions reaching the houses. The restoration of the void is to be built from the base upwards, so dust emissions are likely to be less and the area is sheltered. Dust will be deposited on the faces in the quarry. The potential for dust emissions increases as the level nears the surface levels but the area is still 150 metres away from the houses. The situation will be appraised as the phase of filling takes place between the level shown on plan RA/LEQ/REC16-06 and RA/LEQ/REC16-07.

The potential for dust generation from the activities on the site is generally considered to be when there have been three or more days when the rainfall has been less than 0.2 mm. The properties to the north and east of the site have the greatest sensitivity to the operations as they are in the path of the prevailing winds off the Atlantic and the Jet Stream. Fortunately, winds from the southwest are usually carrying rain clouds so there are damp conditions with these winds. As the backfilling of the void is carried out below ground, the potential for a dust nuisance to be caused as a result of the restoration activity is considered minimal.

The tipping of waste in the void is below ground so the same shelter to the operations will apply until near the surface. The material will be damped down anyway in periods of dry weather to maintain the compaction rates and plasticity of the clay material.

The greatest source of dust from the operations on this site is the processing of the stone which is currently undertaken in the open air. This gives the potential for dust from this operation leaving the site and causing a nuisance downwind of the operations, specifically those to the north/northwest of Lower Edge Road which are downwind of the general prevailing winds. The processing of stone with crushers and screens produces fine particles of dust which is controlled by the planning permissions and the Environmental Health Office. A crusher will be permitted by the Council's Environmental Health Office. The stone blocks are wetted down before being split for transport off site. The mineral waste piles will be damp and when screened the fines pile are damped down in periods of wet weather but the surface cakes unless being loaded so dust emissions are minimal from stockpiles of mineral.

Any dust monitoring using sticky pads and deposition gauges will collect samples of air borne dust, but it could be difficult to differentiate between the constituents of inert waste and the quarried material.

The distance from the source to the sensitive location is crucial. Both airborne dust concentrations, and dust deposition rates, fall off rapidly on moving away from the source. This is primarily due to its dispersion and dilution but is also enhanced by the rapid deposition of the larger particles. The very largest dust particles usually only travel 10 to 20 metres before being deposited. PM₁₀ particles, on the other hand, are not readily deposited and can travel for long distances. The cause of PM₁₀ particles is usually through exhaust gases from diesel engines not operating at the optimum efficiency. Due to the vehicles on site being operated with their designed capacity and the maintenance regime the emissions of diesel particulates is not a risk to the nearby properties. The use of material whether stone or waste is of the larger fraction and the vast majority is deposited within 100m of the source, and hence it is in this zone that the risk of problems from dust is greatest.

To allow for this effect of distance, buffer zones are often defined by mineral and waste planning authorities around potentially dusty activities to ensure that sufficient protection is provided. They have not been established in any rigorous scientific way, but usually range from 50-200m. The 1995 DoE Guidance on dust from surface mineral workings, however, recommends a stand-off distance of 100-200m from significant dust sources (excluding short-term sources), although it is recognised that these distances can be reduced if effective mitigation measures are identified and implemented.

8 Practical Actions

- a) The operator shall appoint a responsible person for dealing with environmental issues on the site. The Site Manager will keep a daily log of the weather conditions, including the direction of the prevailing wind with a brief description of its type, i.e. gentle, breeze, moderate, strong or gale force, rain or dry, previous day's weather and dampness of the working area. This log will include any complaints received, with a record of any investigations carried out and changes to the working practices on that

day. The log will be available for inspection on the site. The weather can be reviewed over a three day forecast by the TV, an app or from the website to ensure that weather conditions and wind speeds are predictable. In periods of dry weather where the prevailing wind could be from the southeast off the European Landmass then the operations can be managed by spreading water on the haul roads and stockpiles. The Beaufort Scale can be used to describe the winds and a wind gauge can be set up on the office building at the site to monitor the wind speeds.

- b) If there are complaints of dust emission at the properties on Lower Edge Road, Church Street or Belgrave Court they will be investigated, and the manager will decide on the appropriate course of action. If the manager does not think that dust emissions can be suppressed using the bowser, then stone processing operations and placement of waste in the void shall cease within 30 minutes of the decision being made until the matter is dealt with.
- c) The operator shall position 3 directional (vertical) dust deposition gauges in locations to be agreed with the Environmental Health Officer of the Council and the Environment Agency if there are complaints regarding nuisance dust, but they will be positioned near to the houses on the north side of the quarry extension beyond the zone of influence of normal waste recovery operations. The gauges would be located on the north side of the quarry as that would cover the area where houses exist on Church Lane, Lower Edge Road and in the central section of the eastern boundary to monitor the houses on Belgrave Court that is 180 metres away from the buttress. The school will also be monitored from a gauge in this location as it is 44 metres away from the recovery operation.
- d) It will be difficult to differentiate between the dust deposits, if they occur, from the quarry and the treatment of recovered waste as the material will be similar unless the dust is sampled using microscopic methods. The only way to assess the overall dust from the recovery operation is to close the quarry operation down for a period to collect dust from the waste recovery operation. That is unlikely to occur as the business of the applicant is to supply building stone. Dust emissions from the site irrespective of their origin have to be dealt with and three deposition gauges should provide the information from a southwest quadrant wind, usually carrying rain to a south easterly wind usually dry. A deposition gauge located on the stockpile or screen mound near to Church Street will monitor dust emissions from the site if the wind is blowing from the east. A gauge located on the soil screening mound on the north side will measure dust source and the zone of influence to the receptors using their houses and gardens. There are large, vegetated bunds on the perimeter of the site on the western side so the properties are protected from dust emissions due to the vegetation and the higher ground for the screen bunds. Normal waste recovery operations are accepting the concrete and brick waste, stockpiling the sized material, laying in the excavation material in the void and levelling off. There are no abnormal waste recovery operations at the site that would breach compliance of the permit or planning permission as the management of the operation will invoke cessation of the importation of the waste until normal operations could commence. Excessive rain or high winds could affect the normal operations by making the site impassable or dust blow could occur in dry windy periods.

- e) In the event that the wind is blowing towards any sensitive properties, the responsible person, who is the quarry manager and or the COTC identified above as the site manager, shall satisfy himself that the control measures are adequate to allow operations to continue. If the control measures are insufficient to prevent dust blow from the operations to the sensitive locations, the processing and filling operations shall cease until the weather conditions improve and the site is safe to recommence operations. The cessation of operations will be within 30 minutes of a decision being made by the manager that dust cannot be suppressed. If there are complaints from the receptors the same procedure will apply until the complaint has been investigated and the dust emissions identified.
- f) The quarry manager shall review the operations if there is a wind change or are periods of dry weather predicted for both the quarrying and recovery. The control measures can be to damp down the stockpiles and haul roads to the void area, the working level on the recovery scheme, suspend processing operations and damp down the fines stockpile. If this cannot be achieved the operations will cease within 30 minutes. Waste material will still be allowed to be imported and tipped out on the south side layer against the mineral tip slope but will not be placed or processed until the dust issue has been dealt with.
- g) All vehicles will use the wheel cleaner situated on site. All vehicles will pass over this until all mud is removed from vehicles leaving the site and onto Lower Edge Road. The access and haul roads will be kept free from mud and debris by a road sweeper to prevent the mud drying out and becoming dry, being pulverised by traffic and then becoming a dust hazard.
- h) The haul road shall be dampened when necessary and the road on Lower Edge Road outside the site entrance will be dampened and brushed if any excess mud or debris from the wheels of vehicles leaving the site has been deposited on the public highway. This will reduce the risk of dust from dried out mud on the road being passed over by traffic.
- i) Upward pointing exhausts will be used on all mobile plant which is used on site.
- j) Speed restrictions of 15mph will be enforced on all vehicles moving on site and on the haul road.
- k) Any complaints of dust nuisance will be observed at the receptor and recorded. If these continue to occur, dust monitoring will be undertaken at the sensitive locations using directional dust deposition gauges. This will be undertaken by the Site Quarry Manager employed by Rand & Asquith who will ascertain the source by suspending the waste recovery operation. To date over the past 12 years there have been no complaints of dust emissions causing a nuisance to the local residents so if they were to occur the cumulative impact would be ascertained to find the source.
- l) Use agreed wet cleaning methods or mechanical road sweepers on all roads during periods of dry weather.

- m) The operator will ensure that a water bowser is kept on site whenever plant is operational and will ensure that all high activity areas such as haul roads can be dampened when necessary.
- n) Clean road edges and pavements using agreed wet cleaning methods such as manual sweeping with brushes that do not scour the tarmac will be used to collect mud, so it does not dry out and be a source of dust.
- o) Provide hardstanding areas for vehicles and regularly inspect and clean these areas.
- p) Where stockpiles of inert material are stored, they must be kept damp and suitably profiled to minimise dust emissions, according to weather conditions. Long term stockpiles of soil making material will be grass seeded or covered with tarpaulin if necessary. Long term stockpiles are likely to be soil making material or clay suitable for the engineering work. These would be stored for a period not exceeding 12 months and are likely to attract ruderal vegetation such as teasels and buddleia if not seeded. The material is also likely to cake if left undisturbed so dust blow would be minimised.

9 Conclusions and Recommendations

The area surrounding the site generally comprises of the residential area to the north, east and west, with open land to the south. The properties to the north and northwest within Zone 1, as shown on drawing EEQ/Dust1, are most at risk to wind borne dust from the south westerlies which blow from southwest to northeast and particular consideration will be paid these areas in particularly dry and windy conditions. Considering the rainfall data from Bradford weather station and the wind rose data from Bingley both of which are close the site in terms of weather most south westerlies are carrying rain clouds.

The quarrying operations at the site are dependent on the requirements of the stone works and the provision of aggregate. The restoration of the site is dependent on the void space created but there is sufficient room to build the haul road shown on plan RA/LEQ/REC 16-04 and fill the void with recovered waste from the base of the quarry to the surface level. It is therefore considered that considering the guidance for the Best Practical Environmental Option and the M17 Guidance, Monitoring Particulate Matter around Waste Facilities that the cessation of the filling operations during adverse weather conditions would reduce the risk of dust emissions. The potential contribution to the current level of dust in the atmosphere, because of the quarrying and backfilling with recovered waste operations, is minimal if operations are ceased when the wind speed can entrain dust particles. Research has concluded that quarries excavating coal measures strata and from that the tipping and stockpiling of quarry excavation waste will not produce levels of PM₁₀ appreciably above the background concentrations. As the site is northeast of the M62 Motorway and the surrounding A roads into Halifax, Elland and Brighouse then the particulate matter in that range is likely to be from traffic and industrial pollution. The particulate size from handling earth on the site irrespective of the source is above 30 micron and usually above 70 micron. Consequently, dust emissions if they extend beyond the site are going to be a nuisance.

It is recommended that monitoring points, if required, using sticky pads be positioned at the most sensitive locations closest to the residential areas to quantify the amount of dust

generated by activities at the site. These can then be measured by the site operator and recorded along with the weather conditions of that particular day. The dust gauges can be left for a period of 14 days to assess the reflectance of the pad after dust has been deposited.

The properties most sensitive to the proposed extension area of the quarry will be to the northeast of the site on Lower Edge Road which is where the mining operations progressed towards and has now ceased within the permit area shown edged green on plan number RA/LEQ/WML/22-02. The waste recovery operation is located in the central area of the east side of the quarry and to the south side is quarry material that has been used to create the switch back haul road on the berm built after refusal of the recovery scheme with reference number RA/LEQ/JAN21-01. The properties north and northwest of the site are more susceptible to dry winds and particular attention will be paid to these properties as they are within the zone of influence and are at risk from south and south easterly winds and the possibility of these winds blowing dust towards these properties.

It is recommended that any water made in the quarry is stored and used in periods of dry weather to suppress any potential for dust. As the recovery operation is brought up in layers a low point will be maintained as a depression to collect surface water runoff from within the permit area. The area is 2.7 hectares so it has been calculated that an area 35 metres by 35 metres and 1 metre deep with sloping sides will collect the rainfall from a 30 minute storm. There will be a water supply at the quarry for the wheel cleaner, offices and the sheds and the processing area can be damped down in periods of dry weather.

Cromwell Mining Consultants
April 2022

References

The control of dust and emissions from construction and demolition, Best Practice Guide (November 2006). Greater London Authority.

Minerals Policy Statement 2 – Controlling and Mitigating the Environmental Effects of Mineral Extraction in England (March 2005) now the NPPF Technical Guidance Note.

Environment Agency – H1 Risk Assessment – Amenity and Accident Risk from Installations and Waste Operations, page 10 and table 3 in annex 2.

Environment Agency – M17 Technical Guidance Note on Monitoring Particulate Matter in Ambient Air around Waste Facilities.

Environment Agency – M8 Technical Guidance Note on Monitoring Ambient Air

IAQM Guidance on the Assessment of Mineral Dust Impacts of Dust for Planning v 1.1
May 2016

Drawings –

RA/LEQ/CMA 01 – Conceptual Model

RA/LEQ/CMA-02 – Conceptual Model

RA/LEQ/WML/22-01 – Permit Area

RA/LEQ/WML/22-02 – Permit area on January 2021 Topographical Survey

RA/LEQ/REC 16-04 – Design Plan Haul Road

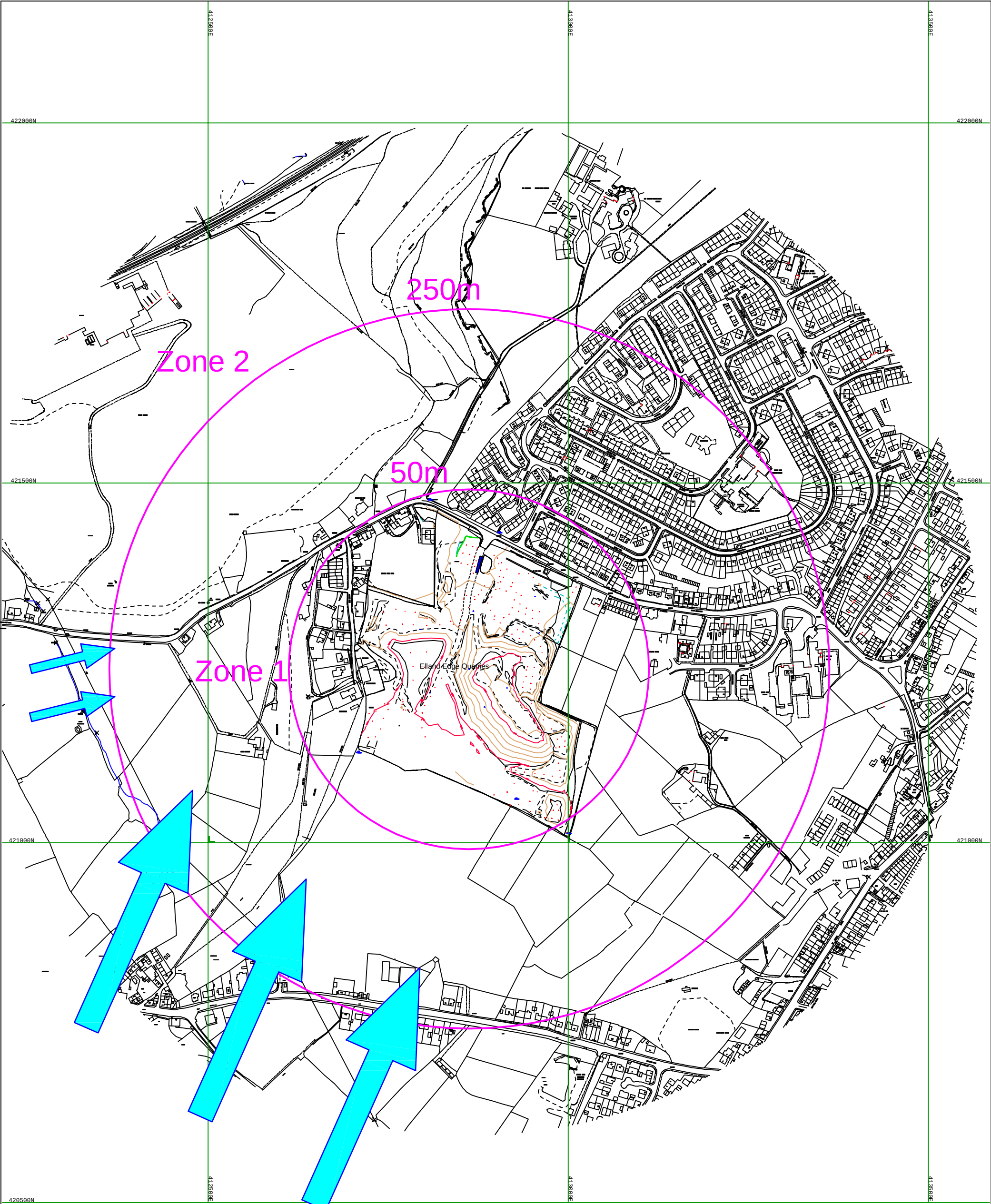
RA/LEQ/REC 16-06 – Designed Fill to 158 metres AOD

RA/LEQ/REC 16-07 – Designed Fill to Surface

RA/LEQ/JAN 21-01 – Topographical Survey 5th January 2021

DUST PLAN

Plan No EEQ DUST 1



Legend:

Top of Bank	BH	Borehole/Tail Pit
Top of Quarry face	BM	Ordinance Survey Bench Mark
Bottom of Bank		
Road		
Track		
Verge		
Fence Type 1		
Fence Type 2		
Fence Type 3		
Gate		
Watercourse/Ditch/Pool		
Overhead Electricity Cable		
Building		

Direction of Prevailing Winds

Dust Zones

50m

REVISIONS		
Date	Description	By
11/11		
11/11		
11/11		
11/11		
11/11		

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Rand & Asquith (Aceblade) Ltd

Job Title
ELLAND EDGE QUARRY

Project Title
DUST ASSESSMENT

Scale
1:5000

Date
JUN11

Drawn by
SW

Checked
JC

Dwg. title
Dust Assessment -
Zones of Influence

DWG No.
EEQ/DUST

Job no.
1

Rev.
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