Review of Air Quality and Dust Assessments: Denbigh Quarry Extension

Client[1]**:** Save Our Green Spaces Dinbych (SOGSD)

Reference: APS_S1060A_1

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1. Introduction

1.1. Kalaco (formerly Air Pollution Services) was instructed by Save Our Green Spaces Dinbych (SOGSD) to critically review the air quality impact assessments undertaken to accompany the planning application (ref. 01/2022/0523) for an extension to the Denbigh Quarry (the 'site') located at Plas Chambres Road, Denbigh, Denbighshire, LL16 3YE.

1.2. The planning application was accompanied by an Environmental Impact Assessment (EIA). The local planning authority, Denbighshire County Council (DCC), instructed Enzygo Environmental Consultants to review the air quality assessment.

1.3. Kalaco has reviewed the following documents:

- Chapter 8, Environmental Statement (ES) Volume 2, Pleydell Smithyman (undated) (referred to as 'Chapter 8' in this report);

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- Appendix 6: 1 Dust Risk Assessment, ES Volume 2, Pleydell Smithyman (undated) (referred to as 'Appendix 6');
- Dust Impact Assessment, Denbigh Quarry, SLR, dated 14 July 2023, ref 425.064845.00001 (referred to as the 'DIA');
- Consultation response from Environmental Public Health service Wales, dated 7 July 2022 (assumed to be incorrectly dated 7 July 2002);
- Air Quality Impacts Assessment Technical Review, Enzygo, dated 5 June 2023 (referred to as 'Enzygo Review 1'); and
- Revised Air Quality Impacts Assessment Technical Appraisal, Enzygo, dated 18 August 2023 (referred to as 'Enzygo Review 2').

1.4. These documents have been reviewed in the context of Planning Policy Wales (2021 edition) (PPW) and Mineral Technical Advice Note (TAN) 1 Aggregates, and DCC planning policy.

2. Expertise

2.1. It is important air quality assessments are carried out by suitably qualified experts with professional accreditations, such as being a full member of the Institute of Air Quality Management (IAQM). Details of the qualifications and experience of the authors reviewing the air quality impact assessments are set out Appendix A1.

3. Planning Policy

3.1. Planning policy requires a balance between the need for extraction of minerals and the protection of the amenity of the local community.

Planning Policy Wales

3.2. Planning Policy Wales (Welsh Government, 2024) requires (paragraph 5.14.43):

> *"Development plans should set out clearly the criteria that will be applied to minerals proposals to ensure that they do not have an unacceptably adverse impact on the environment and the amenity of nearby residents. Issues that must be addressed include:*
>
> - *the control of air pollution namely dust, smoke and fumes"*

3.3. Paragraph 5.14.44 states:

> *"Buffer zones should be used by planning authorities to provide areas of protection around permitted and proposed mineral workings where new development which would be sensitive to adverse impact, including residential areas, hospitals and schools, should be resisted. Within the buffer zone there should be no new mineral extraction or new sensitive development, except where the site of the new development in relation to the mineral operation would be in a location remote from the active mineral site or on the far side of an existing built up area which already encroaches into the buffer zone. Other development, including industry, offices and some ancillary development related to the mineral working, which are less sensitive to impact from mineral operations, may be acceptable within the buffer zone on a case by case basis."*

3.4. Paragraph 5.14.45 states:

"To avoid conflict between mineral workings and other land uses buffer zones should be identified in development plans around existing or proposed minerals sites."

Minerals Technical Advice Note (Wales) Aggregates (2004)

3.5. Minerals Technical Advice Note (Wales) Aggregates (MTAN1) requires the setting of buffer zones around mineral extraction sites, and sets out that for hard rock these should be 200m around the mineral extraction site.

3.6. Paragraph 71 includes:

"The buffer zone should be defined from the outer edge of the area where extraction and processing operations will take place, including site haul roads, rather than the site boundary, as there may be land within site boundaries where mineral activities are limited or no operations are proposed so that the impact of the proximity of such land is negligible. Where mobile plant is likely to be used it will usually be necessary to control by planning conditions the location of the operational area where plant may operate in order to maintain the buffer zone and thus protect amenity."

3.7. It states (in paragraph 70):

"Within the buffer zone, no new sensitive development or mineral extraction should be approved. Sensitive development is any building occupied by people on a regular basis and includes housing areas, hostels, meeting places, schools and hospitals where an acceptable standard of amenity should be expected. Sensitive development could also include specialised high technology industrial development where operational needs require high standards of amenity."

3.8. Paragraph 75 includes:

"Where dust is demonstrated to have the potential to affect the use of land the Welsh Assembly Government takes the view that it is a material planning consideration".

3.9. Paragraph 77 includes:

"Planning conditions can impose:

- *measurable performance requirements - the means of achieving these requirements should be left to the operator;*
- *an adequate and appropriate monitoring scheme of the environmental consequences of aggregates extraction. In some cases, periodic checks may be sufficient but in others, continuous monitoring and regular audit reports may be necessary. Access to monitoring locations must be available to the operator;*
- *ameliorative measures to mitigate impacts, such as the provision of wheel-wash facilities, road cleansing, speed restrictions, sheeting of vehicles;*
- *working programmes/site design and layout - location of dust emission sources away from sensitive development, protection of loading/unloading activities and materials storage areas, control of soil handling and overburden stripping including timing to suit weather conditions"*

Denbighshire County Council Planning Policy

Policy PSE 16 -Mineral Buffer Zones

3.10. Policy PSE 16 of the DCC Local Development Plan 2006-2021 requires the adoption of buffer zones around mineral sites (as required by MTAN1):

> *"Extensions to quarries will only be permitted where a suitable buffer can be retained, i.e. where such an extension would not cause other development to become part of a buffer, and where it can be demonstrated that there is no unacceptable impact on the environment or human health."*

3.11. Sensitive development, as defined within Minerals Planning Policy Wales, includes residential development, hospitals, schools, and specialised high technology. Development which is not sensitive, such as general industry and distribution, is therefore not affected by the buffer zones. For hard rock, the buffer zones are 200 m. These distances will be applied unless there are clear and justifiable reasons for reducing them, in line with Minerals Technical Advice Note 1: Aggregates.

Policy PSE 17 – Future Mineral Extraction

> *"Applications for the extraction of aggregate minerals will only be permitted where it is necessary to maintain stocks of permitted reserves having regard to the Regional Aggregate Working Party apportionment figures, or, where no figure exists, the demonstrated need of the industry concerned.*
>
> *Applications that accord with the above criteria will be permitted provided that all the following criteria are met: …*
>
> *e. Measures to reduce the impact of dust, smoke and fumes are implemented."*

Policy VOE 1– Key Areas of Importance

> *"The following areas will be protected from development that would adversely affect them. Development proposals should maintain and, wherever possible, enhance these areas for their characteristics, local distinctiveness, and value to local communities in Denbighshire:*
>
> - *Statutory designated sites for nature conservation;*
> - *Local areas designated or identified because of their natural landscape or biodiversity value;"*

4. Enzygo Reviews

4.1. The first Enzygo review was critical of the air quality impact assessments, and identified the following shortcomings:

1. It failed to consider all relevant activities including transport, processing and stockpiling.
2. It failed to adequately consider blasting and its mitigation measures. Enzygo considered that this activity should have had a large emission magnitude instead of medium.
3. A wider range of receptors should be considered, including to the east of the site.
4. The pathway effectiveness should have used meteorological data from a site closer than Shawbury, which is 65 km from the site.

4.2. As a result of Enzygo's comments, SLR produced their DIA dated July 2023.

4.3. Enzygo's second review highlighted:

1. Subject to sufficient and agreed mitigation measures being implemented it is agreed that the emission magnitudes specified can be achieved.
2. Enzygo accepted the assessment of pathway effectiveness and that the assessment had considered the most sensitive residential and ecological receptors.
3. Enzygo accepted the impacts identified by SLR subject to agreed planning conditions on dust management.
4. Regarding the human health effects, it was recommended that $PM_{2.5}$ monitoring is continued periodically.

4.4. The second Enzygo review concluded:

> *"The methodology and conclusions of the revised dust impact assessment are accepted. However, this is subject to the implementation of best practice dust control measures throughout the site and with a particular focus on blasting operations. These measures should be provided by means of planning condition requiring an agreed dust management plan and monitoring strategy."*

5. Environmental Public Health Service Wales

5.1. The comments from Environmental Public Health Services Wales concluded:

> *"We have some concerns about the lack of detailed assessment regarding the impact of the quarry operations on local air quality. In our view, further assessment and data are needed to support the applicant's position that activities will not be detrimental."*

5.2. It also notes that:

> *"There is little actual assessment of the impact on local air quality. The applicant has suggested that tree planting and creation of bunds along the site boundary will help reduce impact of dust on the local area. However, without actual data to support this, we cannot agree with this statement. We recommend that the Regulator confirm that they satisfied with this approach, or if not to recommend a more detailed air quality assessment.*
>
> *"Control of emissions relies on the quarry operator applying industry best practice and techniques. The LPA should agree a Dust Management Plan (DMP) so that the amenity of the local area, including nearest residential receptors, and the nearby public footpath, is not affected. This should be made a condition of any planning agreement."*

6. Kalaco Review

Chapter 8 Air Quality and Appendix 6 of the ES

6.1. The planning application aims to extend the extraction area by 5 ha which will extend the life of the quarry to the end of 2047.

Emissions Sources

6.2. The location of the emission sources at the quarry (historic and future) were not explicitly identified.

6.3. The assessment was poorly executed with a too narrow wind sector adopted. It considered only the 5 ha quarry extension area, and not the existing area to the east of the extraction area which would be the beneficiary of the life of the quarry extension to 2047.

Buffer Zone

6.4. The buffer zone indicated on Figure A-1 (Appendix 6) only includes the extraction area of the extension. Planning policy suggests that the buffer zone should be around a wider area than just the extraction area of the extension as there are other dust sources, including the haul routes. It is noted that none of the site plans submitted clearly indicate the locations of the haul routes.

Pathway Effectiveness

6.5. Appendix 6 provides details of the dust risk assessment. A very narrow wind direction was considered for each receptor (~15° wide) for example receptor R15 used a range of 355° to 10° (from Table A-6 in Appendix 6). As shown in Figure 1, the correct sector range to the extension is from 325° to 20° and to the entire site is 325° to 78°. It is necessary to consider all wind directions within the extremities of the extension and existing quarry and associated activities (e.g. the cement batching plant and the haul roads). Consideration of only the 15° sector will have underestimated the pathway effectiveness which in turn could affect the assessment of the impacts.

Figure 1: Angles to Site from Receptor R15

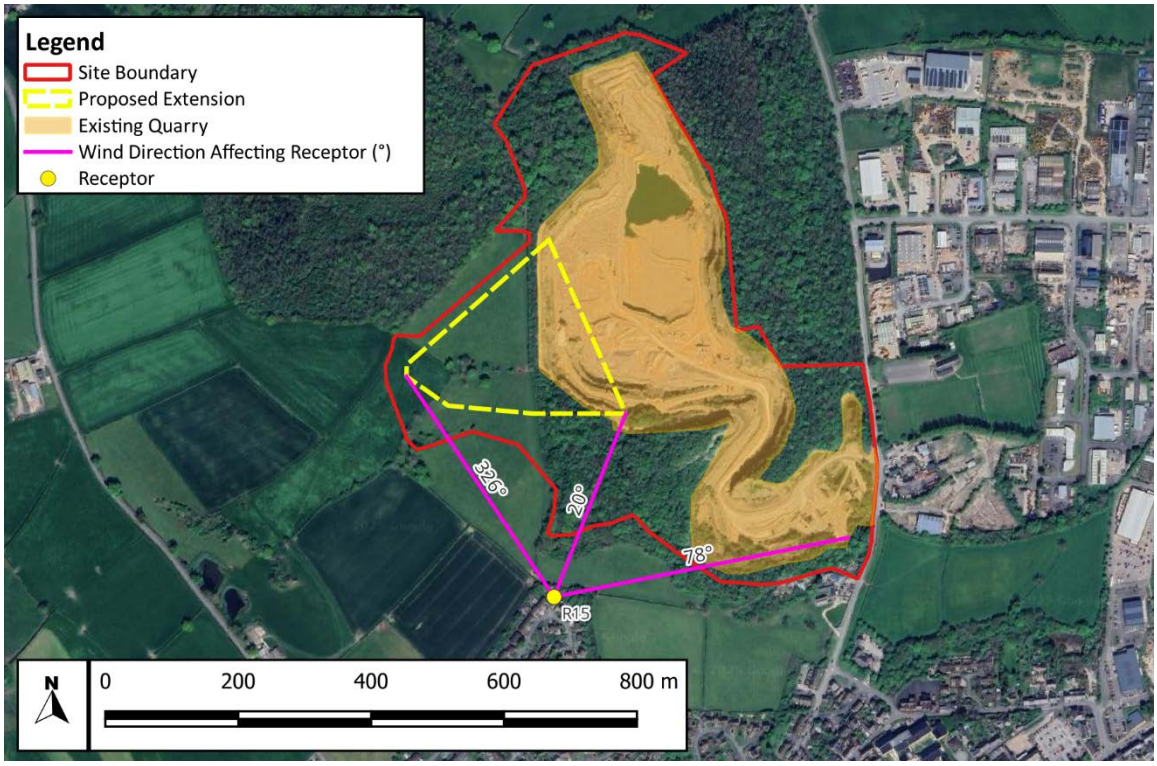


Figure notes: © 2025 Google

6.6. The assessment appears to have considered all days, not just the dry days. The latter is required by the IAQM guidance.

Receptors

6.7. In the original assessment the human receptors were all, apart from one located on a single street (Bryn Seion), to the south of the quarry. The exception was Graig Farm which includes a farmhouse on Ffynnon Barcer (Baker's Well Lane), to the southeast of the quarry.

Meteorological Data

6.8. No justification is given for why the meteorological data from Shawbury was suitable for the assessment. The Enzygo review assumed that distance is the only criteria to use in identifying the most appropriate

observation meteorological site to use in an assessment. The topography and presence of features such as rivers, estuaries, proximity to the coast, and data capture rates should also influence the choice of meteorological data. It is important that an assessment justifies the choice of meteorological data.

6.9. Kalaco is a licensed supplier of Met Office observation data and producer of modelled numerical weather prediction (NWP) data to Government bodies, air quality consultants and others, and has special expertise in meteorological data.

6.10. Figure 2 illustrates the variation in wind direction and speeds between the centres of adjacent 3 km x 3 km grid squares, using Kalaco's modelled NWP data. This variation, over relatively short distances, demonstrates why it is important that air quality assessments justify the data used.

6.11. Figure 3 shows the variation in observational (i.e., measured) meteorological data for one year. The site to the bottom right is from Shawbury.

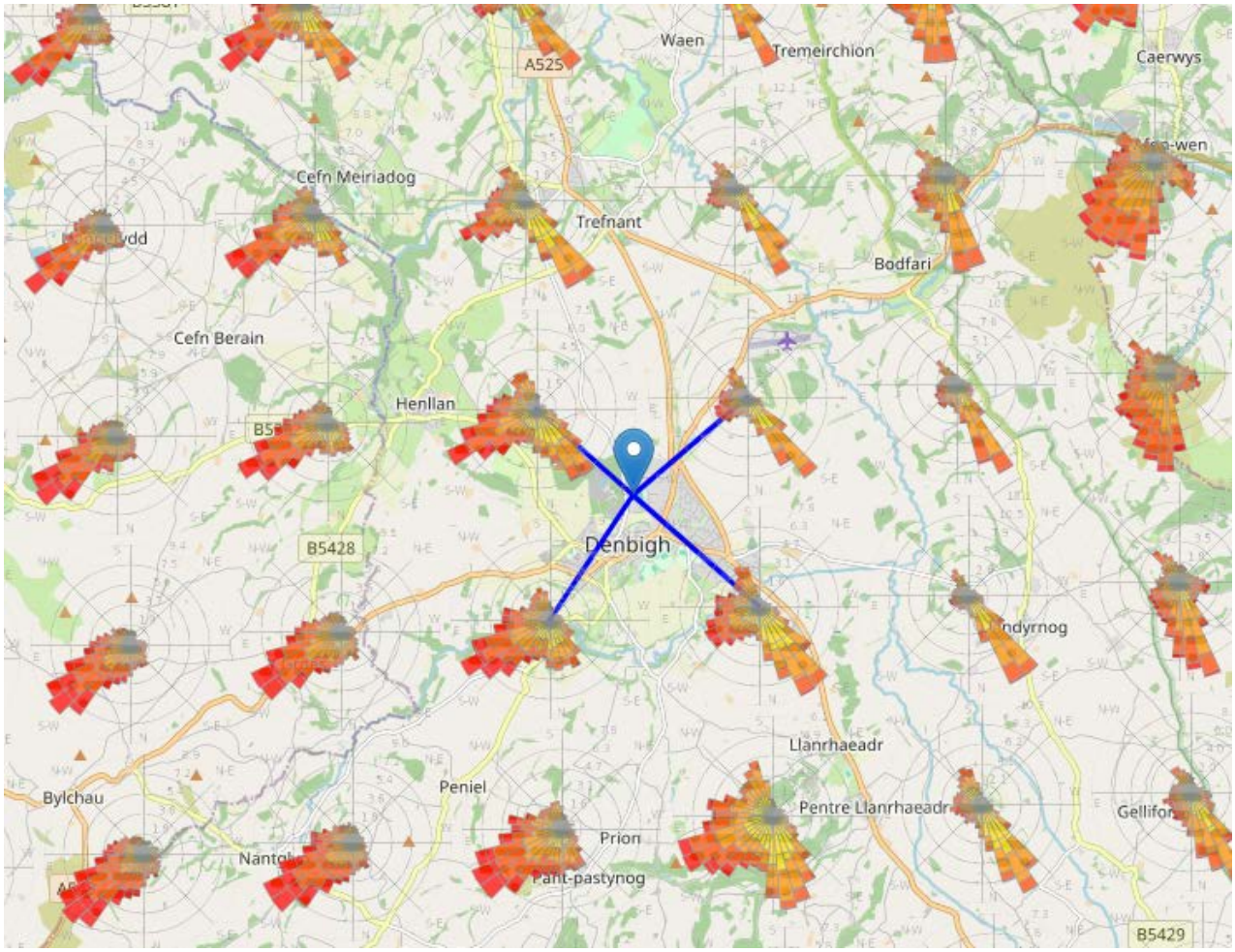
6.12. Figure 4 shows the data from Shawbury used in the ES.

6.13. Figure 2 to Figure 4 illustrate the significant differences between locations, showing that in the absence of a well located on-site meteorological station there is significant uncertainty regarding the wind data. There is clearly a topographic influence on local wind conditions which is not accounted for by using the observational data. This uncertainty is not acknowledged in the ES.

6.14. One approach to overcoming the uncertainty regarding the appropriateness of the wind data used is to take a more precautionary approach in the assessment, for example regarding the emission magnitudes. This has not been done.

6.15. Furthermore, no consideration has been given to increasing wind speeds as a result of climate change over the life of the quarry (to end of 2047). Current climate forecasts suggest more frequent storms with higher wind maximum wind speeds.

Figure 2: 3km x 3km NWP Windroses for 2024



Marker represents postcode: LL16 5US.
Screenshot from envirodataservics.co.uk

Figure 3: Observational Sites Windroses for 2024

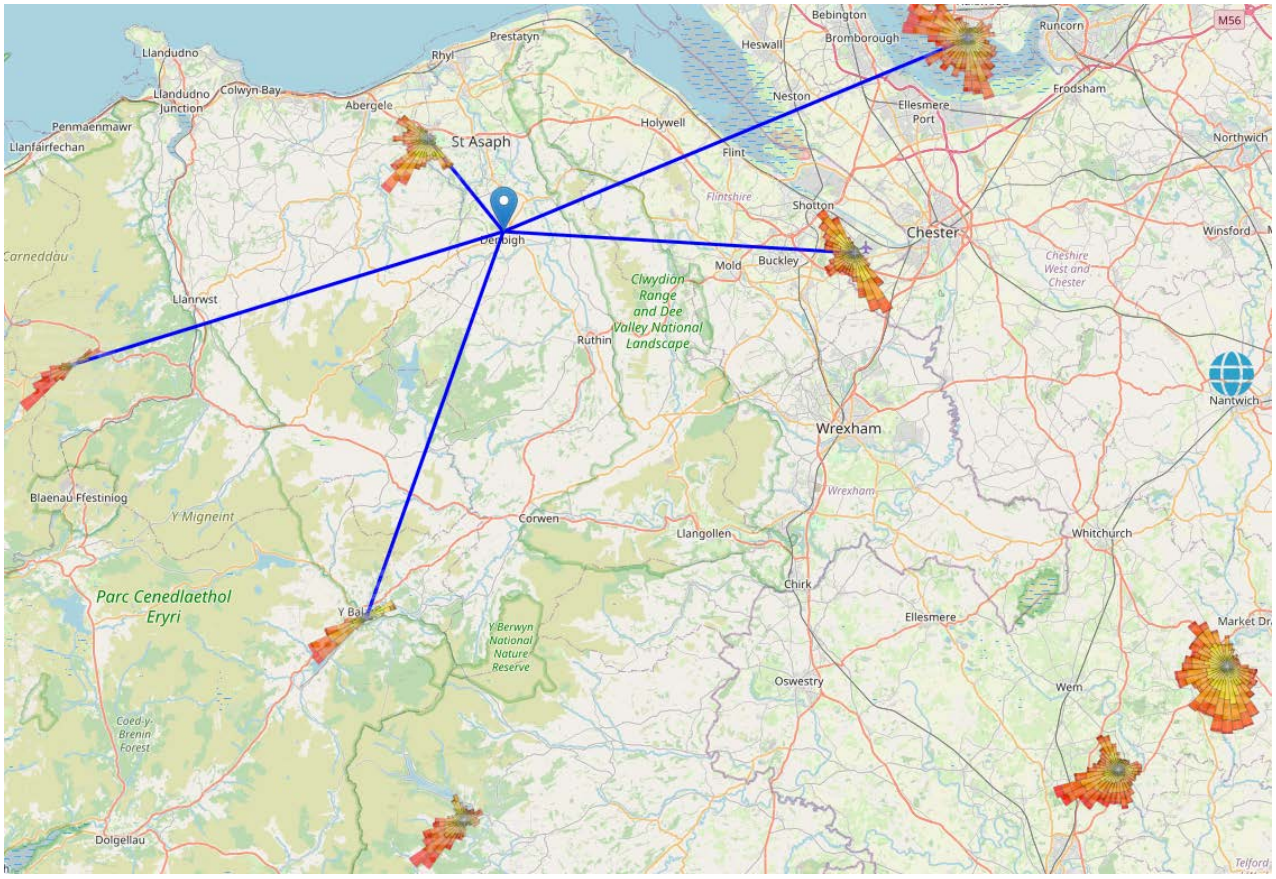
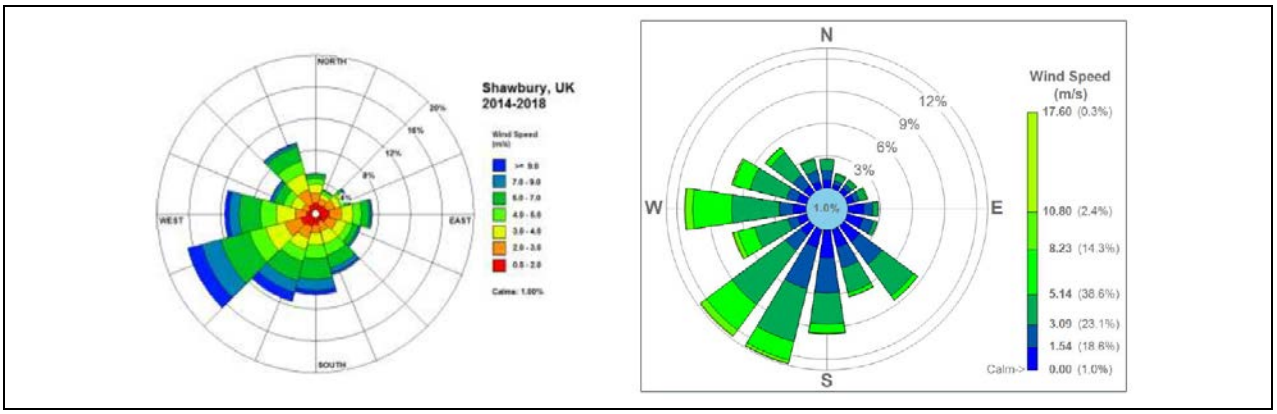


Figure notes:
Shawbury is the wind rose to the SE of the figure, Rhyl is the wind rose northwest of Denbigh.
Marker represents postcode: LL16 5US.
Screenshot from envirodataservices.co.uk

Figure 4: Windroses Presented in 1. Appendix 6 of Volume 2 ES (left); and 2.SLR Report (right)



Summary

6.16. The ES was not fit for purpose as it failed to correctly assess the dust impacts.

Dust Impact Assessment, Denbigh Quarry, SLR

6.17. The DIA addressed the concerns raised by Enzygo in Review 1.

6.18. Whilst it is more thorough, the DIA fails to provide equivalent tables to Table 6-7 and Table 6-9 in ES Appendix 6. These provide the percentage of the time that winds of different speeds come from each

direction. It is unknown, therefore, whether the issue of considering very narrow wind directions (10-15°), which was not identified in the Enzygo Review 1 or Enzygo Review 2, has been corrected (as discussed in paragraph 6.5). For example, Figure 5 shows the extension is in the sector between 325° and 353° while the site is between 325° and 78°. If the analysis of the wind data has not been corrected the DIA is not fit for purpose.

Figure 5: Angles to Site from Receptor R1 (DIA)

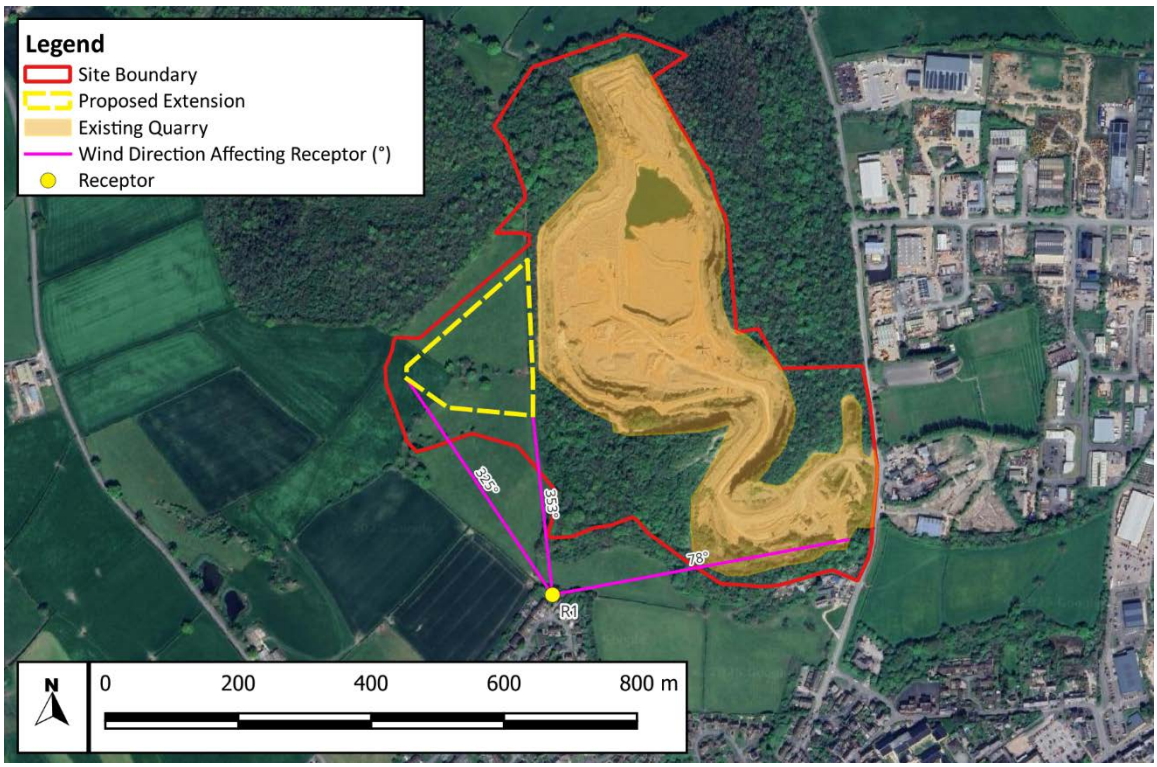


Figure notes: © 2025 Google

6.19. The DIA mentions (section 4.3.4):

> *"In relation to dust, the Site are not aware of any recent dust complaints."*

6.20. It is clear that the site does not record complaints as they should do in accordance with a management plan or they would not state that they are 'not aware', either there are complaints or there are not. This suggests the existing operation may not be as well managed as it should be. Furthermore, it is understood from SOGSD that this is not accurate, as complaints have been made but have been dismissed by the site staff.

6.21. It should also be noted that the absence of complaints should not be taken to imply that the local community is not being adversely affected by dust.

Meteorological Data

6.22. Wind data from Rhyl, the closest observational meteorological site to Denbigh Quarry, for the years 2016-2020 were used in the DIA. Figure 4 shows the 2016-2020 wind rose presented in the SLR report.

6.23. The Shawbury data presented in the ES (Appendix 6) were for 2014-2018. It is not known why more recent data were not used. By July 2023, when the DIA report was published, data for 2022 were likely to have been available. It is considered good practice to use the most recent data available as the climate is changing.

6.24. It is clear from all the available wind roses that winds from the north which would affect the dwellings on Bryn Seion are less common than winds from the west and southwest. However, in the absence of wind data collected at the site there is significant uncertainty regarding the conditions in the area as Figure 2 and Figure 3 illustrate. Assessments should take account of the uncertainty and be precautionary. The local topography clearly influences the wind direction (as shown in Figure 2 which shows different wind rose patterns around Denbigh).

6.25. The 2017 EIA Regulations require the uncertainties in the assessment to be described. This has not been provided.

Environmental Design and Mitigation Measures

6.26. The DIA relies on design and mitigation measures to identify the 'Residual Source Emissions Magnitude' and to conclude that the impacts are not significant. Section 7 of the DIA states:

> *"'These conclusions rely on the implementation of operational mitigation measures and the environmental design measures throughout the proposed development".*

6.27. These measures include wheel wash facilities and a road sweeper:

- Section 5.4.1: 'wheel wash facilities are utilised by HGVs leaving site;'
- Section 5.4.1 ' road sweeper employed on the Site access road, as required; and
- Section 5.4.2: 'wheel wash facilities are installed near the Site exit;'

6.28. The report suggests in Section 5.4.1 that the measures listed are already employed in line with industry good practice and that the site has an existing wheel wash.

6.29. Figure 6 shows a number of screenshots of satellite imagery and street views. It should be noted that with effective wheel washing, the route out of site should be as clean as the route into the site. The screenshots clearly show a significant level of dust on the local road (wheel tracks out from the site) and the site exit route. There is no clear evidence of an effective wheel wash system. This should be employed on site for the current operations, implying that the operator is not effectively minimising trackout and dust on roads. Therefore, there is a significant risk that this will continue, regardless of any planning conditions, and the DIA is understating the impacts based on the reliance of measures which the imagery suggests have not been implemented.

6.30. This, along with paragraphs 6.19 to 6.21, suggests that the site is not as well managed as it should be.

Figure 6: Satellite Imagery and Street View Imagery

Figure notes:

Image 1 (top)(© 2024 Microsoft Corporation) and Image 2 (© 2025 TomTom, © OpenStreetMap, © Vexcel Imaging) are from Bing Maps.

Image 3 (© 2025 Google) and Image 4 (© 2025 Airbus, Bluesky, Infoterra Ltd & COWI A/S, Maxar Technologies, Map data © 2025 Google) are from google maps.

Planning Policy

6.31. The DIA includes relevant national and local planning policies but does not discuss their implications.

6.32. Local planning policy PSE16 Mineral Buffer Zones states that extension to quarries will only be permitted where a suitable buffer can be retained (see paragraph 3.10). The closest dwelling is, according to the DIA (Table 4-1: Human Receptors) 61 m from the quarry working area. Presumably these policies were not in place when the quarry was first granted planning consent.

6.33. Whilst it can be argued that this receptor is more than 200m from the new extraction area, there are two elements to an 'extension': geographical and temporal. Planning permission for the extension of the quarry will mean an additional 19 years (from the recently granted extension, 2028, to 2047) of residential use within the buffer zone. Therefore, there will be residential properties within the buffer zone set out in planning policy.

Human Health

6.34. The impacts on human health have been considered following the IAQM minerals guidance. This is based on the likelihood of an exceedance of the air quality objective for particulate matter, specifically PM_{10}. The IAQM guidance is currently being revised to incorporate increased knowledge since it was published in 2016.

6.35. The PM_{10} objectives are:

- annual mean concentration of 40 µg/m^3; and
- 24-hour mean of 50 µg/m^3 not to be exceeded more than 18 times per year.

6.36. These objectives were set in the 1990s, since when evidence on the health effects has increased significantly. In setting the objectives the government considered the technical and economic feasibility of achieving them. Note that they should have been achieved two decades ago.

6.37. The EIA Regulations require consideration of human health. The World Health Organization's air quality guidelines (WHO AQGs) are based solely on the health evidence and are significantly lower than the objectives. For PM_{10} these are:

- annual mean of 15 µg/m^3; and
- 24-hour mean of 45 µg/m^3 not to be exceeded more than 3-4 days per year.

6.38. For $PM_{2.5}$ they are:

- annual mean of 5 µg/m^3; and
- 24-hour mean of 15 µg/m^3.

6.39. The recent report from the Royal College of Physicians (2025) highlights the significance of the health effects of air pollution, and that they occur at levels below the statutory requirements:

> *"Around 30,000 deaths are estimated to be attributable to long-term exposure to air pollution in the UK each year, with the health impacts of air pollution including dementia estimated to cost the UK £50 billion in 2019. With new and growing evidence of health harms, including at low concentrations, air pollution must be recognised as a public health issue."*

6.40. The WHO AQGs have not been considered in either the ES or the DIA.

6.41. Paragraph 4.3.4. of the DIA provides some data from a monitoring campaign in 2021. This short-term monitoring campaign measured $PM_{2.5}$ and PM_{10} at two locations on the northern and southern quarry boundaries

6.42. It should be noted that the DIA states in paragraph 4.3 that,

> *"monitoring data prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment…"*

6.43. This clearly contradicts the inclusion and use of data from 2021.

6.44. The three-month data suggest that the annual mean WHO AQG for PM_{10} may be achieved, but $PM_{2.5}$ may not be achieved. The highest period means measured at the southern boundary were:

- PM_{10}: 8.3 µg/m^3; and
- $PM_{2.5}$: 6.0 µg/m^3

6.45. No information is provided regarding the instrument used to measure the concentrations, and therefore no indication of the veracity of this data. To more accurately compare this data with the WHO AQGs, 12 months monitoring data is required. As a minimum, the data should have been 'annualised' using relevant data from Defra's automatic urban and rural monitoring network, a technique that is widely used to convert incomplete data to an annual mean.

6.46. Finally, it should also be noted that The Environment (Air Quality and Soundscapes) (Wales) Act 2024, requires the setting of an ambitious $PM_{2.5}$ target and there is a risk that mineral extraction sites which are not well managed may risk the achievement such a target.

7. Conclusions

7.1. The original ES chapter assessment was inadequate, with significant errors in the assessment in addition to those identified by DCC's consultant. These additional errors were:

- no discussion of the assessment uncertainties as required by the EIA Regulations;
- no discussion of the health effects as required by the EIA Regulations; and
- incorrect assessment of the pathway effectiveness.

7.2. The DIA did not rectify these shortcomings as:

- It does not discuss the uncertainties of the assessment particularly in relation to the variation in wind data at the site.
- It compares the monitored concentrations of PM_{10} against the annual mean objective and did not state the equipment used (i.e. to provide confidence in the measurements):
  - Nominally, the objective was set for the protection of human health, but it is widely acknowledged that health effects occur at concentrations well below the PM_{10} objective.
  - Three months of data is not long enough to compare with an annual mean objective due to seasonal variation in emissions and meteorological conditions, both affecting ambient concentrations.
  - The DIA does not discuss the health implications of the measured PM_{10} and $PM_{2.5}$ concentrations. WHO AQGs are not mentioned.
- Insufficient information has been provided to demonstrate that the error identified in assessing the pathway effectiveness has been rectified particularly in relation to the wind direction.
- The existing mitigation measures which are being relied upon in the assessment are clearly not effective and should not be relied upon.
- The operator does not appear to have a system in place to record and manage complaints which is a concern.
- The DIA assessed the potential impacts at the nearest receptor which lies within 200m of the site. It does not, however, mention that policy prohibits development within 200m of an existing sensitive receptor (MTAN 1 and local plan policy PSE16). This is a planning application that will both extend the size and life of the quarry. The 200m buffer was set to protect amenity. No consideration

has been given to the impact on amenity for almost 20 years from 2028 (when the current time extensions expires) and 2047 (the forecast completion of quarry subject to the appeal).

7.3. In conclusion, the information provided by the applicant with respect to the dust and particulate matter emissions from the quarry is insufficient to conclude that there will be no significant adverse effect due to air emissions.

7.4. However, in Kalaco's opinion these arguments are not strong. We would not expect to see significant adverse impacts given the distance between the emission sources and the nearest dwellings, even if the errors in the assessments were adequately addressed. However, this statement is subject to the operator managing the site effectively in line with an appropriate management plan and this does not appear to be the case to date.

8. Glossary

DCC	Denbighshire County Council
DIA	Dust Impact Assessment IAQM
DMP	Dust Managmeemnt Plan
EIA	Environmental Impact Assessment
ES	Environmental Statement
IAQM	Institute of Air Quality Management
MTAN1	Mineral Technical Adve Note 1: Aggregates
NWP	Numerical weather prediction
Objective	A concentration that should not be exceeded at all or exceeded more than a permitted number of days per year.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres
PPW	Planning Policy Wales
SOGSD	Save Our Green Spaces Dinbych (SOGSD)
WHO	World Health Organization
$\mu g/m^3$	Microgrammes per cubic metre, a unit used for concentrations of a pollutant in air

A1. Appendix: Biographies of Authors

Kieran Laxen, MEng (Hons) MIEnvSc MIAQM

A1.1. Kieran is a Director and the founder of Kalaco. He has nearly 20 years' experience of air quality and during this time has worked on hundreds of projects, including port schemes, road schemes, residential and commercial developments, industrial processes, energy from waste sites, and infrastructure projects. He has extensive experience of ambient air quality monitoring and dispersion modelling for planning and permit applications. Kieran is the IAQM Vice Chair and is leading the development of professional guidance documents on dispersion modelling, greenhouse gas assessment and air quality assessment for planning. He developed Kalaco's meteorological data services, processing Met Office data and creating numerical weather prediction (NWP) data. He is a member of the Welsh Government's Clean Air Advisory Panel on Air Quality.

Dr Claire Holman, BSc (Hons), PhD CSci CEnv FIEnvSc FIAQM

A1.2. Claire, a Director of Kalaco, has over 40 years of experience in air quality management. She has advised national governments in Europe, Asia and Africa, as well as the European Commission on a range of strategic air quality and climate change issues. She has undertaken a large number of air quality, odour and dust assessments for planning and permit application, and provided expert evidence for inquiries, hearings, litigation and Parliamentary Committees. She has critically reviewed assessments undertaken by other consultants for local planning authorities and residents' groups. Claire has contributed to the development of IAQM professional guidance (including leading the development of the IAQM minerals guidance), is the honorary IAQM President and a former IAQM chair, has been a member of a government air quality review group, chairs the Welsh Government's independent panel on NO_2 compliance and advised the Department for Transport on their cleaner vehicles and fuels research programme.

Paul Outen BSc (Hons) MIEnvSc MIAQM

A1.3. Paul is an Associate Director of Kalaco and has over 17 years' experience in the field of air quality and odour consultancy, with extensive experience in the assessment of air quality and odours from a wide range of industries across the UK, Europe and China. He is experienced in undertaking all types of air quality assessments for both planning and permitting purposes. Paul has successfully acted as an expert witness at public hearings and inquiries.

Liana Malynczakova, MSc BA (Hons) AMIEnvSc AMIAQM

A1.4. Liana is a Consultant at Kalaco having previously completed a MSc Sustainability degree at University of Southampton where she was involved in a European research project on shipping emissions, drawing on her previous six months' research internship at the Air Quality Management Resource Centre (AQMRC) at University of the West of England (UWE) where she also completed her geography degree. She is currently gaining experience in undertaking air quality, odour, dust, climate change, indoor air quality and bioaerosol assessments for a wide range of developments for planning and permitting applications and support for local authorities. She is an Associate Member of IAQM.