



Dust and Air Quality Innovation and Expertise

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Quarterly non-technical summary: Mountsorrel particulate matter, dust and weather monitoring

Date range: Quarter 3 2023 (26 May – 25 August 2023)

Date Report Issued: 01 November 2023

Introduction

Every month, the results of ongoing dust and particulate matter monitoring at Mountsorrel Quarry are compiled and summarised in ‘compliance’ reports, which are then shared with Charnwood Borough Council (CBC), Leicestershire County Council (LCC) and Environment Agency. The monitoring results are discussed in more detail during liaison meetings held with CBC and LCC on a quarterly basis.

Once the quarterly liaison meetings are held, we prepare these cover letters to provide a non-technical overview of the most recent three months of finalised reports. This letter covers the period from 26 May to 25 August 2023.

An explanation of how and why dust and air quality are measured on site is available [here](#).

Weather summary

Early June was dry but abnormally cool, with later June and July being warmer and quite wet. August was generally drier and warmer than the preceding months.

Winds from the northeast were dominant during June, whilst winds from the south, southwest and west were more common during July and August.

Deposited dust

During this period, deposited dust levels were below the site-specific limit level at all locations, with the exception of a single exceedance at Stn 1B (off Kinchley Lane) in July 2023. Given the location of this monitor, and the period during which the exceedance was recorded, it is likely that this was related to agricultural activities rather than on-site activities.

The frequency of limit level exceedances over the previous three months is shown for each monitoring location in Figure 1 using pie charts.



Figure 1: Frequency of high dust levels, Quarter 3 2023

Particulate Matter – PM_{2.5}

PM_{2.5} concentrations remained well within the relevant Air Quality Objective (AQO) at both Hawcliffe Road and Quorn House during the third quarter of 2023, as shown in Figure 2, with concentrations being slightly higher at Hawcliffe Road compared to Quorn House.



Figure 2: PM_{2.5} monitoring summary, Quarter 3 2023

Particulate Matter – PM₁₀

Although the results were higher at Hawcliffe Road than at Quorn House for the third quarter of 2023, PM₁₀ concentrations were within the annual AQO and the daily AQO at both locations.

No days were recorded with concentrations above the daily AQO threshold (50 µg/m³) at either location during this quarter.



Figure 3: PM₁₀ monitoring summary, Quarter 3 2023

Complaints

During the third quarter of 2023 a number of complaints related to dust were received by the quarry. Each complaint was responded to in accordance with the process outlined in the Dust Management and Monitoring Plan.

DustScanAQ
November 2023



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June 2023 particulate matter, dust and weather monitoring report for Mountsorrel Quarry

Client:	Tarmac Trading Limited
Site:	Mountsorrel Quarry, Quorn
Job Code:	ZLFMS
Report Start Date:	26 May 2023
Report End Date:	29 June 2023
Date Report Issued:	02 August 2023

'Dust' is generally regarded as particulate matter up to 75 µm (micron) diameter and can be considered in two categories. Fine dust, essentially particles up to 10 µm, is commonly referred to as PM₁₀ and is measured to agreed standards and forms part of the national Air Quality Objectives (AQO). The AQO for PM₁₀ is currently 50 µg/m³ for the 24-hour mean, not to be exceeded 35 times per year and 40 µg/m³ for the annual mean. The previous AQO for PM_{2.5} was 20 µg/m³ however from 31 January 2023 the interim AQO for PM_{2.5} is 12 µg/m³ for the annual mean (to be achieved by 2028), whilst the legal AQO for PM_{2.5} is 10 µg/m³ for the annual mean (to be achieved by 2040) as per The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023¹. Following correspondence with Charnwood Borough Council, it was agreed to compare PM_{2.5} measurements against the interim objective.

Coarser dust (essentially particles greater than 10 µm) is generally regarded as 'nuisance dust' and can be associated with annoyance, although there are no official standards (such as AQO) for dust annoyance.

Weather conditions can have a significant effect on the potential for dust propagation from a minerals site. Of particular importance are wind speed, wind direction, and precipitation. Dust can be carried from a source towards receptors (such as nearby homes and other businesses) according to the strength and direction of wind. Precipitation is recognised to suppress dust and 0.2 mm antecedent rainfall is considered sufficient to suppress windblown dust for a number of hours.

Mountsorrel Quarry has a comprehensive Dust Management and Monitoring Plan (DMMP). The DMMP was developed in 2011 and subject to regular review and revision, in consultation between Tarmac and the local regulators (Leicestershire County Council (LCC) and Charnwood Borough Council (CBC)).

The DMMP is enacted through the quarry Site Improvement Plan (SIP). The SIP sets out a programme of actions to reduce the environmental impact of specific areas of the site operation.

¹ Statutory Instrument. (2023), 'The Environmental Targets (Fine Particulate Matter) (England) Regulations', No. 96. King's Printer of Acts of Parliament

Particulate matter, dust and weather monitoring

Particulate matter (in the form of PM₁₀ and PM_{2.5}) and weather are measured at one location each and deposited and directional dust are routinely measured at thirteen locations around Mountsorrel Quarry.

For particulate matter, a Turnkey Osiris sampler is currently located at Stn 9 (Hawcliffe Road). This recognised and certificated 'indicative' real-time device is connected to its own wind vane and anemometer and provides near-instantaneous directional PM₁₀ PM_{2.5} and PM₁ data directly to the quarry management team. Through the use of appropriate correction factors as agreed with CBC and LCC, data from the Osiris may be compared against the relevant Air Quality Objectives for particulate matter.

Charnwood Borough Council (CBC) operates a Partisol PM₁₀ sampler which is located within the Leicestershire County Council (LCC) depot at the southern end of Hawcliffe Road, in close proximity to the Osiris device. Due to ongoing reliability issues with this monitor for CBC it is being phased out. As of July 2022 CBC also operates a Zephyr air quality monitor at the same location. This device measures a number of pollutants including PM₁₀ and PM_{2.5}.

A weather station is located at the site offices off Wood Lane and collects a range of weather parameters over fifteen minute intervals. Data from the weather station are available to the quarry management by means of a dedicated modem connection to the internet.

The majority of the dust samplers around Mountsorrel Quarry comprise the 'Frisbee-type' deposition gauge combined with an adhesive 'sticky pad' directional gauge. These samplers are used to monitoring 'nuisance' dust and samples from these instruments are collected on a monthly basis.

Key monitoring locations are set out in Table 1 and shown in Figure 1.

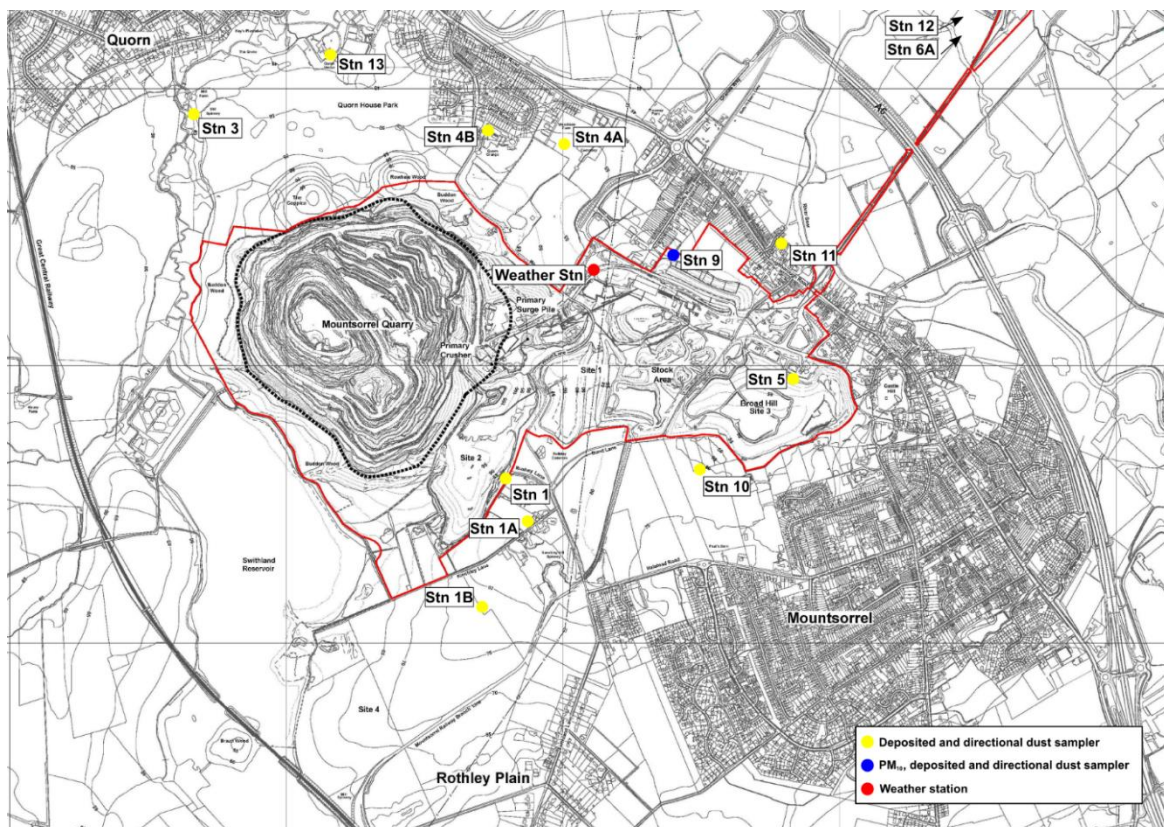


Figure 1: Particulate matter, dust and weather monitoring locations, Mountsorrel Quarry

Table 1: Weather station, PM₁₀ and dust monitoring locations, Mountsorrel Quarry

Sampler reference	Easting	Northing	Locality monitored
Stn 1	456781	314577	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1A	456891	314436	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1B	456715	314109	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 3	455681	315847	Mill Farm; Quorn House
Stn 4A	457000	315805	Woodside Farm; Leicester Road
Stn 4B	456733	315778	Quorn Grange, Unitt Road, Northage Close, Quorn Park
Stn 5	457789	314941	Bond Lane; Crown Lane
Stn 6A	458660	316786	Sileby Road; Huston Close; Sileby Road (commercial)
Stn 9 (inc. PM)	457374	315398	Hawcliffe Road
Stn 10	457487	314626	Glebe Close; Halstead Road (south); Halstead Road (north)
Stn 11	457791	315458	Loughborough Road; River Soar (marina / caravan park)
Stn 12	458575	315459	Meadow Farm Marina and Caravan Park
Stn 13	456158	316090	Northage Close, Meeting Street
Weather Station	457126	315376	Wood Lane Site Offices

Site Improvement Plan (SIP)

The SIP is updated regularly by quarry management, with support from DustScanAQ through site visits and reports and quarterly reviews with LCC and CBC.

Weather monitoring summary

The key weather data which might affect dust propagation (wind speed, wind direction, total daily precipitation and average daily temperature) for this reporting period are summarised in Figure 2 and Figure 3.

The period 26 May 2023 – 29 June 2023 is characterised by mild to warm temperatures. The maximum daily average temperature was 22.5 °C recorded on 25 June and the minimum daily temperature was 10.8 °C recorded on 31 May.

The monitoring period was generally dry with precipitation recorded on only 29% of the total days. The majority of the rainfall occurred in the second half of the monitoring period, with significant rainfall (39 mm) recorded on 18 June. There was an 11-day dry spell for which there may have been an increased potential for dust propagation from site activities beyond the site boundary.

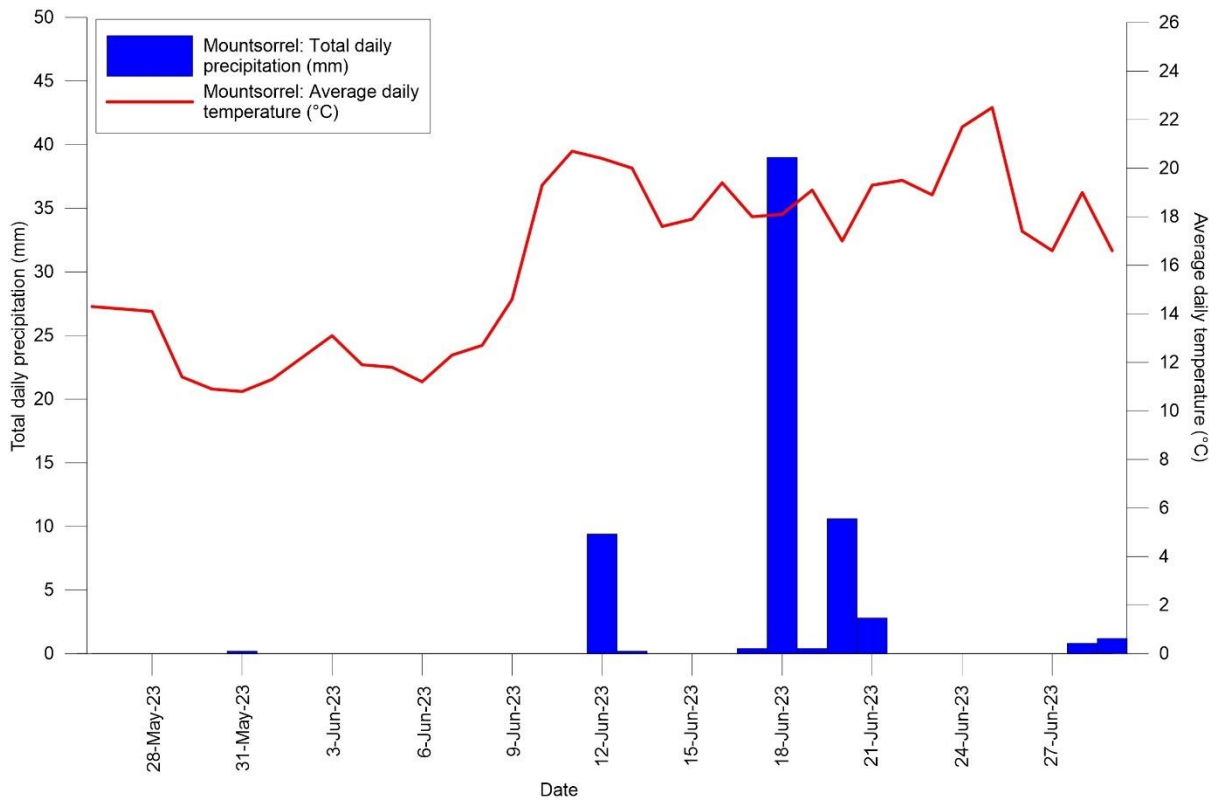


Figure 2: Total daily precipitation and average daily temperature, Mountsorrel Quarry, 26 May 2023 – 29 June 2023

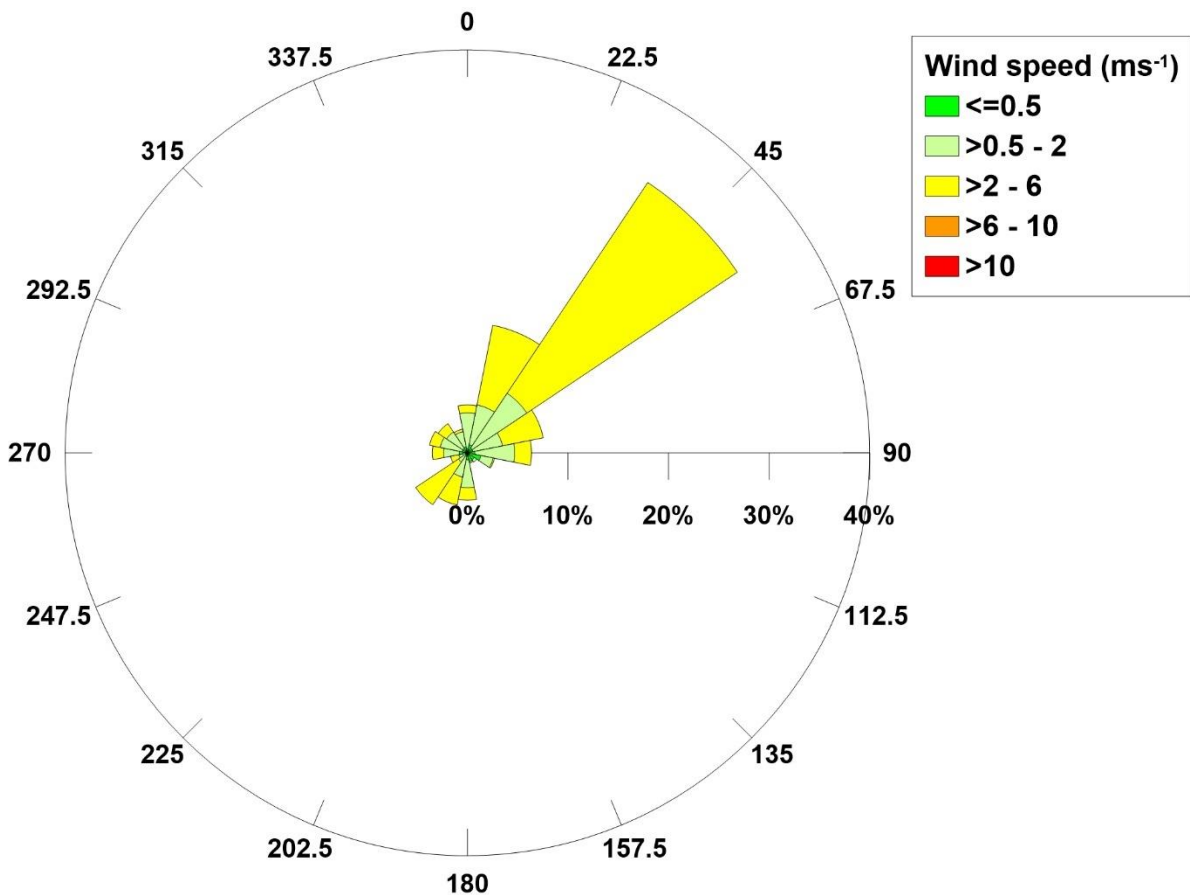


Figure 3: Wind rose, Mountsorrel Quarry, Mountsorrel, 26 May 2023 – 29 June 2023

As seen in Figure 3, winds for this monitoring period were predominantly moderate (>2 – 6 m/s) and from the northeast. Consequently, there may have been a reasonable potential for dust propagation to the southwest.

PM₁₀ and PM_{2.5} monitoring summary

The available data from the past 3 months from the Osiris at Stn 9, together with data from the Defra Automatic Urban and Rural Network (AURN) station in Leicester University² are shown in Figure 4 and Figure 5. No data from the Partisol operated by CBC³ were available for this monitoring period, although a full dataset from the Zephyr was available.

Data from the AURN station are shown to consider correspondence with, or difference from, national air quality elsewhere in the UK. Where sufficient data are available, it is clear that PM₁₀ levels at all locations occasionally track each other closely, and during other periods there can be considerable variation between the units. These patterns are typically indicative of regional and local PM₁₀ and PM_{2.5} signals respectively.

PM₁₀

With regard to numerical analysis of the data:

- For the 12 months up to 29 June 2023, there were 365 daily PM₁₀ readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM₁₀ concentration for the 12 months to date (and using the annual calibration factor) was 19.15 µg/m³, which is approximately 47.9 % of the annual average PM₁₀ concentration objective (40 µg/m³); and
- For the 12 months up to 29 June 2023 there were 26 recorded instances where the daily average PM₁₀ concentrations (using the daily factor) exceeded 50 µg/m³. From the data collection rate this is equivalent to 26 days with a 24-hour average above 50 µg/m³ in a full year as the data collection rate was 100 %.

In summary, for the 12 months up to 29 June 2023 neither the annual nor daily AQO were exceeded.

Figure 4 shows that over the previous three months of monitoring up to the time of this report, there were no exceedances of the daily average threshold.

Details of past exceedances can be found in previous compliance reports.

² <http://uk-air.defra.gov.uk/networks/network-info?view=aurun>

³ https://www.charnwood.gov.uk/pages/mountsorrel_quarry

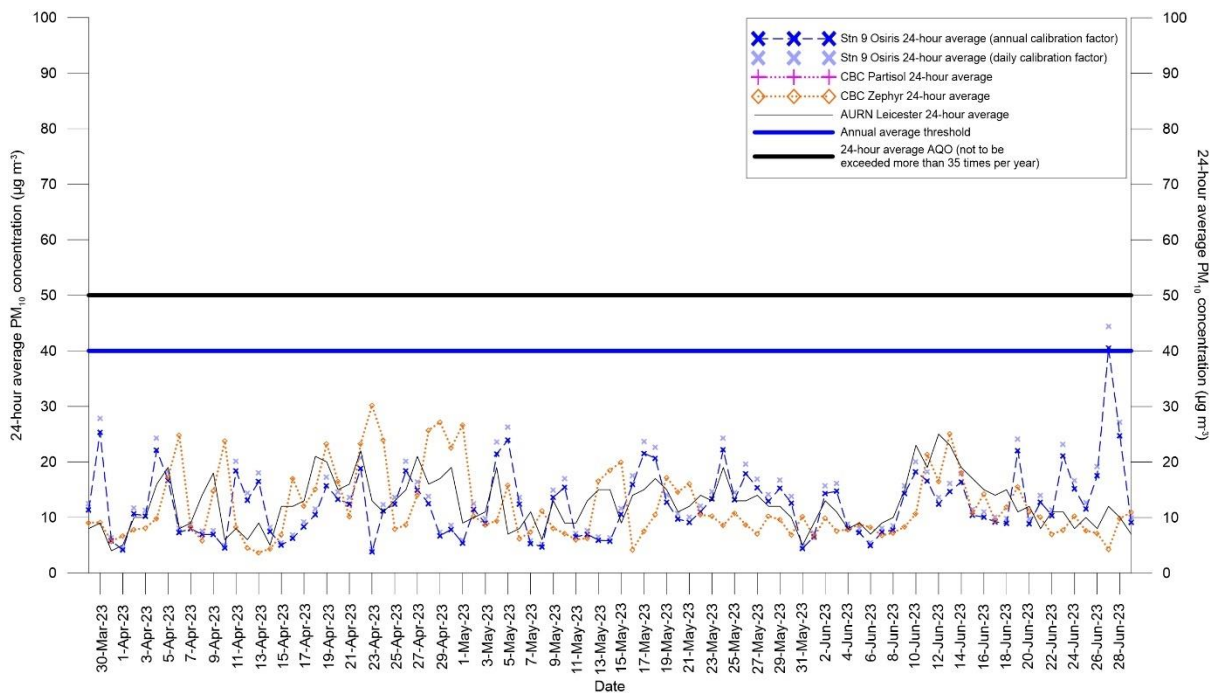


Figure 4: PM₁₀ data, most recent 3 months (up to 29 June 2023)

Between 26 May 2023 – 29 June 2023, trigger emails alerting staff to high PM₁₀ levels from the direction of site operations were sent out once. Details of the corresponding causes and investigations are provided in Table 2.

Table 2: Email alert responses, 26 May 2023 – 29 June 2023 (using the trigger threshold, 125 µg/m³ for the 15-minute average)

Date of alert	Details	Possible cause and investigation
27/06/2023	Exceedance recorded at 9pm from the southwest	Loadout reclaiming ballast. The team had restarted claiming material before the supervisor had switched on the dust suppression spray on 26b.

The PM₁₀ data from the CBC Zephyr for this period are shown in orange in Figure 4. The data from this device typically corresponds relatively well with the AURN data from Leicester, whilst it doesn't generally correspond with the data from the Osiris which, it should be noted had previously been calibrated to correspond with the Partisol.

PM₁₀ concentrations recorded by the Osiris tended to be higher than those reported by the AURN station and the Zephyr. However there were short periods, notably early April, late April, mid-May and mid- June where concentrations reported by the Osiris were lower than those reported elsewhere.

Importantly, these discrepancies must be recognised as typical for different monitoring equipment, demonstrating that in many cases there can be no definitive data, just a range of indicative results which must be interpreted with great care.

Discussions are ongoing between Tarmac, DustScanAQ, CBC and LCC regarding the discrepancies between the different datasets and how they should be presented in these reports.

PM_{2.5}

With regard to numerical analysis of the PM_{2.5} data:

- For the 12 months up to 29 June 2023, there were 365 daily PM_{2.5} readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM_{2.5} concentration for the 12 months was 6.76 µg/m³, which is approximately 56.3 % of the interim annual average PM_{2.5} concentration objective (12 µg/m³) applicable from 31 January 2023.

As with PM₁₀ data, differences in the magnitudes of values recorded by the different instruments demonstrate the challenge in accurately measuring air quality indicators and the significance of expert interpretation of the data.

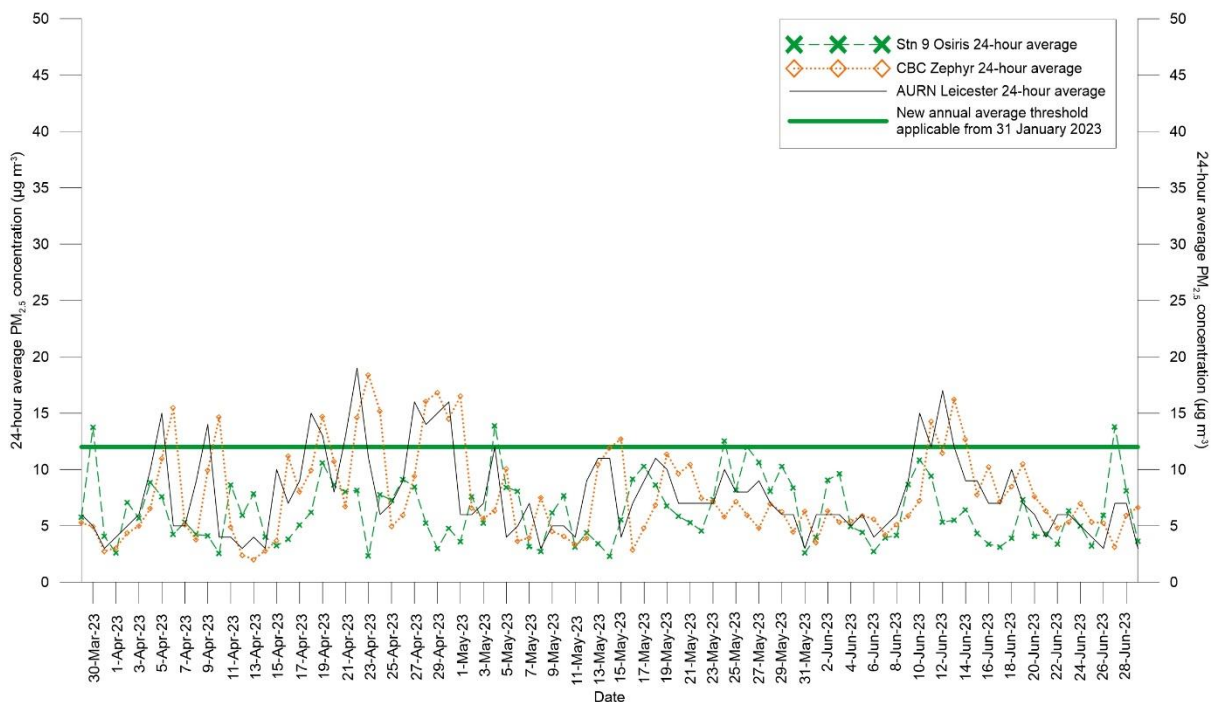


Figure 5: PM_{2.5} data, most recent 3 months (up to 29 June 2023)

Deposited dust monitoring summary

The deposited dust data for 26 May 2023 – 29 June 2023 are summarised in Table 3. The DMMP sets out a site-wide deposited dust threshold of 125 mg/m²/day ‘undissolved solids’ as a trigger limit for investigation to identify the potential dust source/s, taking account of the directional data.

Table 3 shows that, for the available data, deposited dust levels during 26 May 2023 – 29 June 2023 were within the site-wide threshold for all stations. Slightly Elevated levels (84 and 108 mg/m²/day) were recorded at Stn 1 and Stn 1A, respectively. Low levels (58, 61, 71 and 72 mg/m²/day) were recorded at Stn 1B, Stn 4A, Stn 10 and Stn 12, respectively. All other stations recorded Very Low depositional magnitudes. Stn 9 was contaminated with flies.

Table 3: Summary of deposited dust (undissolved solids), 26 May 2023 – 29 June 2023

Undissolved solids (mg/m ² /day)				
This month report start date:		26-May-23		
This month report end date:		29-Jun-23		
Receptor location	Nearest / appropriate dust monitoring point	Reported value	Trigger: ≥ 125 ^a	Magnitude ^b
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	84	No	Slightly Elevated
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	108	No	Slightly Elevated
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	58	No	Low
Mill Farm; Quorn House	Stn 3	34	No	Very Low
Woodside Farm, Leicester Road	Stn 4A	61	No	Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	50	No	Very Low
Bond Lane; Crown Lane	Stn 5	24	No	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	27	No	Very Low
Hawcliffe Road	Stn 9	No data	No data	No data
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	71	No	Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	45	No	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	72	No	Low
Quorn House Park	Stn 13	18	No	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of mass deposition rate assessed against typical rate for semi-rural areas (30 - 80 mg/m²/day)

Regarding dust deposition over time, the rates across the sampling area have varied considerably. Trends in dust deposition rates (as undissolved solids) for the previous 12 months, together with the site-wide dust threshold are illustrated in Figure 6.

In general, as would be expected, dust deposition rates are typically lower in winter months than in summer months. This trend is clearly seen for most monitoring points in Figure 6, with some exceptions. Dust deposition rates have been consistently below the ‘trigger limit’ at all sampling locations except Stn 1B and 9, although the exceedances at Stn 1B are known to be related to nearby agricultural activities, rather than on-site processes.

In general, as shown in Figure 6, higher rates of dust deposition have been recorded near industrial settings (*i.e.* Stn 9) than in more residential areas (*e.g.* Stn 1, Kinchley Lane).

Finally, it is important to note from Figure 6 that dust deposition rates were largely well within the site-wide trigger level during the previous 12 months although rates at Stn 9 have been at or above the trigger level two times over this period and once at Stn 1B (although the latter is likely to be anomalous). The average dust deposition rate at Stn 9 for the previous 12 months (90 mg/m²/day) is below the site-specific threshold. It should be noted that due to contamination by insects, it was not possible to process the depositional dust sample from Stn 9 for this period.

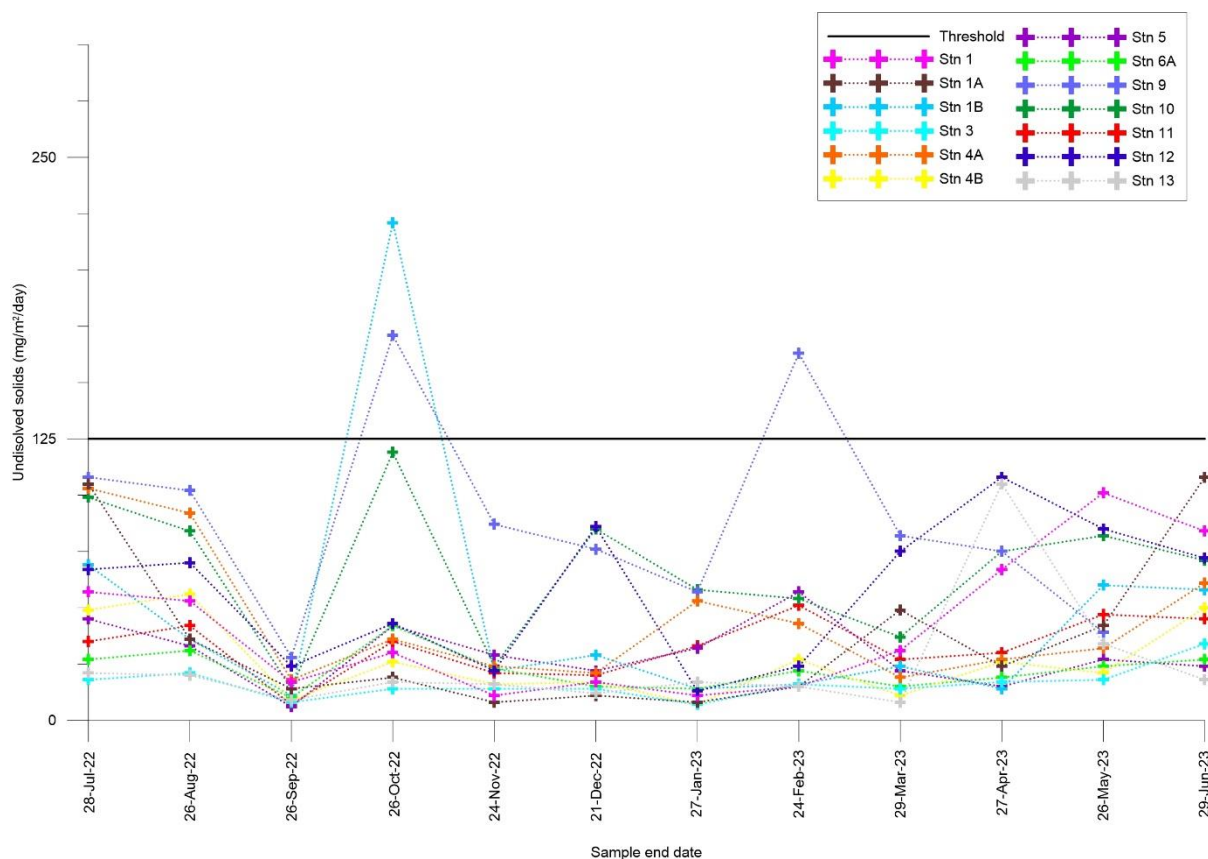


Figure 6: Dust deposition rates per sampling location over time (past 12 months)

Directional dust monitoring summary

The directional dust data for 26 May 2023 – 29 June 2023 are summarised in Table 4. As with deposited dust, the DMMP sets out a site-wide directional dust threshold. For directional dust soiling, 0.5 % effective area coverage (EAC) per day is a trigger limit for investigation to identify the likely dust source/s, again taking account of the direction.

Table 4 shows that during 26 May 2023 – 29 June 2023, most of the stations recorded Very Low dust levels from all directions.

Table 4: Summary of directional dust soiling, 26 May 2023 – 29 June 2023

Directional dust soiling (%EAC/day) by direction (°)											
This month report start date:		26-May-23									
This month report end date:		29-Jun-23									
Receptor location	Nearest / appropriate dust monitoring point	Direction (°)									
			0	45	90	135	180	225	270	315	
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Reported value	0	0.1	0	0.1	0	0.1	0	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Reported value	0.1	0.2	0.1	0.1	0	0.1	0.1	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Reported value	0.1	0	0	0.1	0	0.1	0.1	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Mill Farm; Quorn House	Stn 3	Reported value	0.1	0.1	0.1	0	0	0	0	0	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Woodside Farm, Leicester Road	Stn 4A	Reported value	0	0.1	0.1	0	0	0	0.1	0	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Reported value	0	0.1	0.3	0.1	0.1	0.1	0.1	0	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Bond Lane; Crown Lane	Stn 5	Reported value	0.1	0	0	0.1	0.1	0.1	0.1	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Sibley Road; Huston Close; Sibley Road (commercial)	Stn 6A	Reported value	0	0.1	0.1	0.1	0.1	0.1	0.1	0	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Hawcliffe Road	Stn 9	Reported value	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low	
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Reported value	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low	Very Low	
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Reported value	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Meadow Farm Marina and Caravan Park	Stn 12	Reported value	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.2	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Low	Low	Very Low	Very Low	Very Low	Very Low	Low	
Quorn House Park	Stn 13	Reported value	0.1	0	0	0	0	0	0	0.1	
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No	
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of directional dust soiling derived from Beaman and Kingsbury, 1981

^c Direction/s not determined for daily EAC below 0.1%/day (very low soiling)

Table 5 shows that average directional soiling rates have been at very low levels at most monitoring locations, for most directions, over the past year. At Stn 9, the annual average soiling rate to date was 0.2 % EAC/day from the southwest and west resulting in 'Low' magnitudes being recorded. The cause or causes of these consistently, but marginally elevated dust soiling rates at this monitoring point are under review, as they may be related to site activities such as operations at the PSV yard, Granite Way and/or the toast rack.

Stn 10, also recorded an annual average soiling rate to date of 0.2 % EAC/day from the southwest. This is most likely due to the ongoing construction work in this direction.

Table 5: Running average directional dust soiling (past 12 months)

Receptor location	Nearest / appropriate dust monitoring point		Direction (°)							
			0	45	90	135	180	225	270	315
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Average value	0	0	0	0	0	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Average value	0	0.1	0	0	0	0	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Average value	0	0	0	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Mill Farm; Quorn House	Stn 3	Average value	0	0.1	0	0.1	0	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Woodside Farm, Leicester Road	Stn 4A	Average value	0	0.1	0.1	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Average value	0	0.1	0.1	0.1	0.1	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Bond Lane; Crown Lane	Stn 5	Average value	0	0	0	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	Average value	0	0.1	0.1	0	0	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Hawcliffe Road	Stn 9	Average value	0	0.1	0.1	0.1	0	0.2	0.2	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Average value	0.1	0	0	0.1	0.1	0.2	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Average value	0	0.1	0.1	0.1	0.1	0.1	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	Average value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn House Park	Stn 13	Average value	0	0	0	0	0	0	0	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of directional dust soiling derived from Beaman and Kingsbury, 1981

^c Direction/s not determined for daily EAC below 0.1%/day (very low soiling)

Complaints

During 26 May 2023 – 29 June 2023 a number of complaints related to dust were received by the quarry. Each complaint was responded to in accordance with the process outlined in the DMMP.

**DustScanAQ
August 2023**



Dust and Air Quality Innovation and Expertise

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July 2023 particulate matter, dust and weather monitoring report for Mountsorrel Quarry

Client:	Tarmac Trading Limited
Site:	Mountsorrel Quarry, Quorn
Job Code:	ZLFMS
Report Start Date:	29 June 2023
Report End Date:	28 July 2023
Date Report Issued:	25 September 2023

'Dust' is generally regarded as particulate matter up to 75 µm (micron) diameter and can be considered in two categories. Fine dust, essentially particles up to 10 µm, is commonly referred to as PM₁₀ and is measured to agreed standards and forms part of the national Air Quality Objectives (AQO). The AQO for PM₁₀ is currently 50 µg/m³ for the 24-hour mean, not to be exceeded 35 times per year and 40 µg/m³ for the annual mean. The previous AQO for PM_{2.5} was 20 µg/m³ however from 31 January 2023 the interim AQO for PM_{2.5} is 12 µg/m³ for the annual mean (to be achieved by 2028), whilst the legal AQO for PM_{2.5} is 10 µg/m³ for the annual mean (to be achieved by 2040) as per The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023¹. Following correspondence with Charnwood Borough Council, it was agreed to compare PM_{2.5} measurements against the interim objective.

Coarser dust (essentially particles greater than 10 µm) is generally regarded as 'nuisance dust' and can be associated with annoyance, although there are no official standards (such as AQO) for dust annoyance.

Weather conditions can have a significant effect on the potential for dust propagation from a minerals site. Of particular importance are wind speed, wind direction, and precipitation. Dust can be carried from a source towards receptors (such as nearby homes and other businesses) according to the strength and direction of wind. Precipitation is recognised to suppress dust and 0.2 mm antecedent rainfall is considered sufficient to suppress windblown dust for a number of hours.

Mountsorrel Quarry has a comprehensive Dust Management and Monitoring Plan (DMMP). The DMMP was developed in 2011 and subject to regular review and revision, in consultation between Tarmac and the local regulators (Leicestershire County Council (LCC) and Charnwood Borough Council (CBC)).

The DMMP is enacted through the quarry Site Improvement Plan (SIP). The SIP sets out a programme of actions to reduce the environmental impact of specific areas of the site operation.

¹ Statutory Instrument. (2023), 'The Environmental Targets (Fine Particulate Matter) (England) Regulations', No. 96. King's Printer of Acts of Parliament

Particulate matter, dust and weather monitoring

Particulate matter (in the form of PM₁₀ and PM_{2.5}) and weather are measured at one location each and deposited and directional dust are routinely measured at thirteen locations around Mountsorrel Quarry.

For particulate matter, a Turnkey Osiris sampler is currently located at Stn 9 (Hawcliffe Road). This recognised and certificated 'indicative' real-time device is connected to its own wind vane and anemometer and provides near-instantaneous directional PM₁₀ PM_{2.5} and PM₁ data directly to the quarry management team. Through the use of appropriate correction factors as agreed with CBC and LCC, data from the Osiris may be compared against the relevant Air Quality Objectives for particulate matter.

Charnwood Borough Council (CBC) operates a Zephyr air quality monitor which is located within the Leicestershire County Council (LCC) depot at the southern end of Hawcliffe Road, in close proximity to the Osiris device. This device measures a number of pollutants including PM₁₀ and PM_{2.5}.

A weather station is located at the site offices off Wood Lane and collects a range of weather parameters over fifteen minute intervals. Data from the weather station are available to the quarry management by means of a dedicated modem connection to the internet.

The majority of the dust samplers around Mountsorrel Quarry comprise the 'Frisbee-type' deposition gauge combined with an adhesive 'sticky pad' directional gauge. These samplers are used to monitoring 'nuisance' dust and samples from these instruments are collected on a monthly basis.

Key monitoring locations are set out in Table 1 and shown in Figure 1.

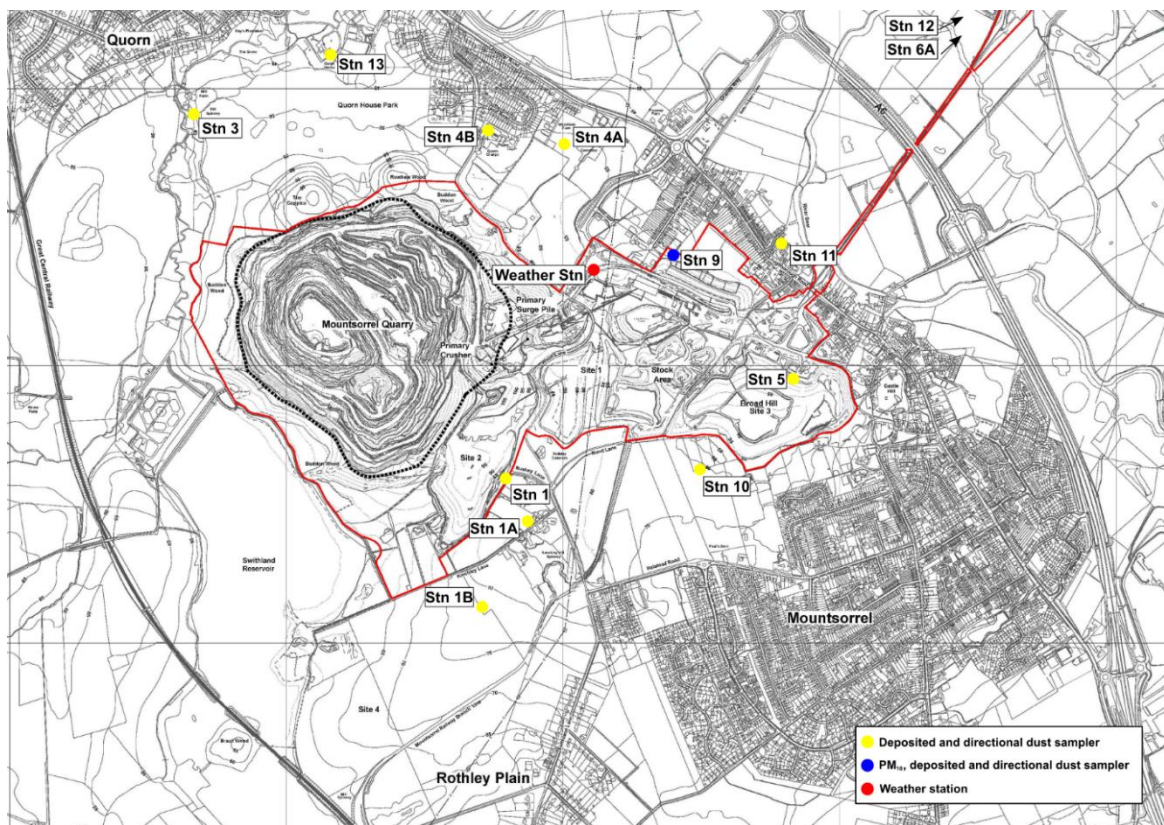


Figure 1: Particulate matter, dust and weather monitoring locations, Mountsorrel Quarry

Table 1: Weather station, PM₁₀ and dust monitoring locations, Mountsorrel Quarry

Sampler reference	Easting	Northing	Locality monitored
Stn 1	456781	314577	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1A	456891	314436	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1B	456715	314109	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 3	455681	315847	Mill Farm; Quorn House
Stn 4A	457000	315805	Woodside Farm; Leicester Road
Stn 4B	456733	315778	Quorn Grange, Unitt Road, Northage Close, Quorn Park
Stn 5	457789	314941	Bond Lane; Crown Lane
Stn 6A	458660	316786	Sileby Road; Huston Close; Sileby Road (commercial)
Stn 9 (inc. PM)	457374	315398	Hawcliffe Road
Stn 10	457487	314626	Glebe Close; Halstead Road (south); Halstead Road (north)
Stn 11	457791	315458	Loughborough Road; River Soar (marina / caravan park)
Stn 12	458575	315459	Meadow Farm Marina and Caravan Park
Stn 13	456158	316090	Northage Close, Meeting Street
Weather Station	457126	315376	Wood Lane Site Offices

Site Improvement Plan (SIP)

The SIP is updated regularly by quarry management, with support from DustScanAQ through site visits and reports and quarterly reviews with LCC and CBC.

Weather monitoring summary

The key weather data which might affect dust propagation (wind speed, wind direction, total daily precipitation and average daily temperature) for this reporting period are summarised in Figure 2 and Figure 3.

The period 29 June 2023 – 28 July 2023 is characterised by mild to warm temperatures. The maximum daily average temperature was 20.5 °C recorded on 08 July and the minimum daily temperature was 14.0 °C recorded on 04 July.

The monitoring period was generally wet with precipitation recorded on 63 % of the total days and the majority of the dry days occurred in the first half of the monitoring period.

The total amount of wet days during the monitoring period is more than what would be expected for summer months, therefore this increased precipitation may have helped to suppress dust levels on site to levels not typically expected for this time of year.

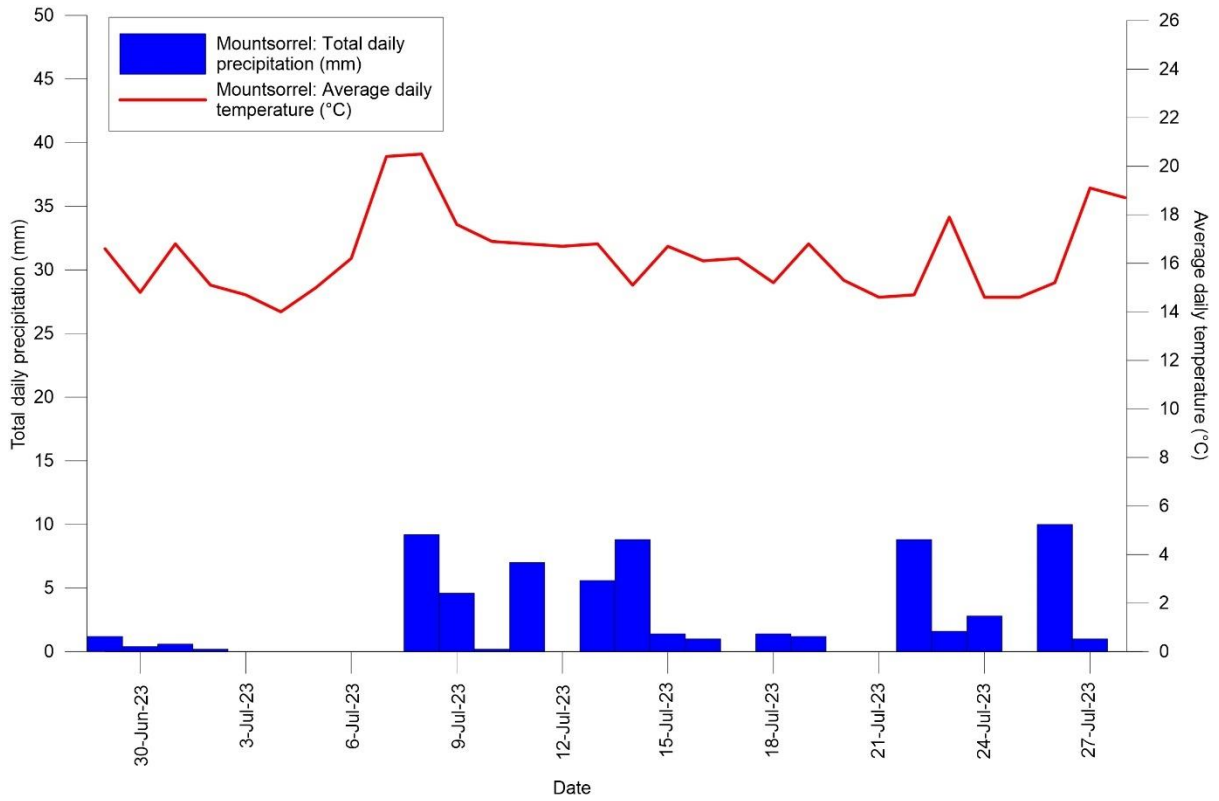


Figure 2: Total daily precipitation and average daily temperature, Mountsorrel Quarry, 29 June 2023 – 28 July 2023

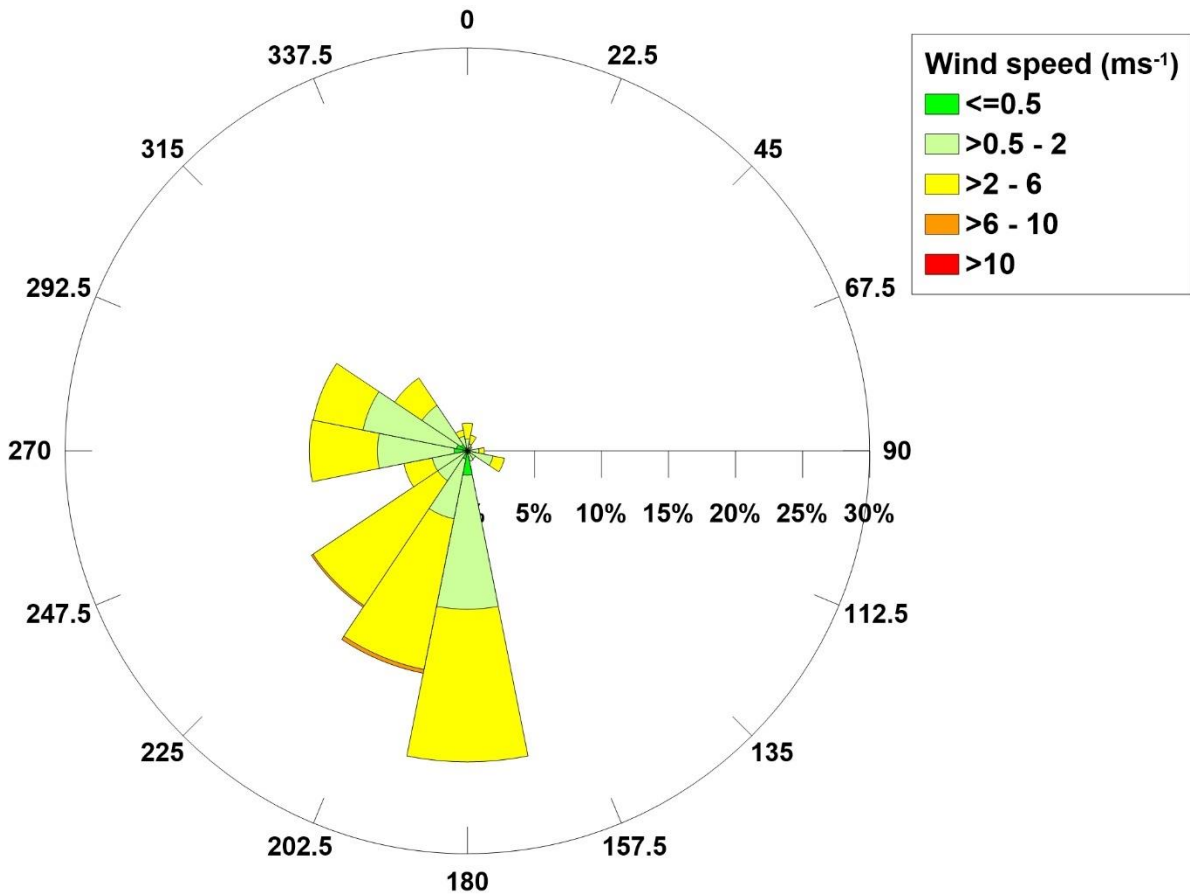


Figure 3: Wind rose, Mountsorrel Quarry, Mountsorrel, 29 June 2023 – 28 July 2023

As seen in Figure 3, winds for this monitoring period were predominantly moderate in speed (>2 – 6 m/s) and from the south. Consequently, there may have been a slight potential for dust propagation to the north.

PM₁₀ and PM_{2.5} monitoring summary

The available data from the past 3 months from the Osiris at Stn 9, together with data from the Defra Automatic Urban and Rural Network (AURN) station in Leicester University² are shown in Figure 4 and Figure 5. Data from the Zephyr operated by CBC³ were also available for this monitoring period.

Data from the AURN station are shown to consider correspondence with, or difference from, national air quality elsewhere in the UK. Where sufficient data are available, it is clear that PM₁₀ levels at all locations occasionally track each other closely, and during other periods there can be considerable variation between the units. These patterns are typically indicative of regional and local PM₁₀ and PM_{2.5} signals respectively.

PM₁₀

With regard to numerical analysis of the data:

- For the 12 months up to 28 July 2023, there were 365 daily PM₁₀ readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM₁₀ concentration for the 12 months to date (and using the annual calibration factor) was 18.43 µg/m³, which is approximately 46.1 % of the annual average PM₁₀ concentration objective (40 µg/m³); and
- For the 12 months up to 28 July 2023 there were 21 recorded instances where the daily average PM₁₀ concentrations (using the daily factor) exceeded 50 µg/m³. From the data collection rate this is equivalent to 21 days with a 24-hour average above 50 µg/m³ in a full year as the data collection rate was 100 %.

In summary, for the 12 months up to 28 July 2023 neither the annual nor daily AQO were exceeded.

Figure 4 shows that over the previous three months of monitoring up to the time of this report, there were no exceedances of the daily average threshold.

Details of past exceedances can be found in previous compliance reports.

² <http://uk-air.defra.gov.uk/networks/network-info?view=aurun>

³ https://www.charnwood.gov.uk/pages/mountsorrel_quarry

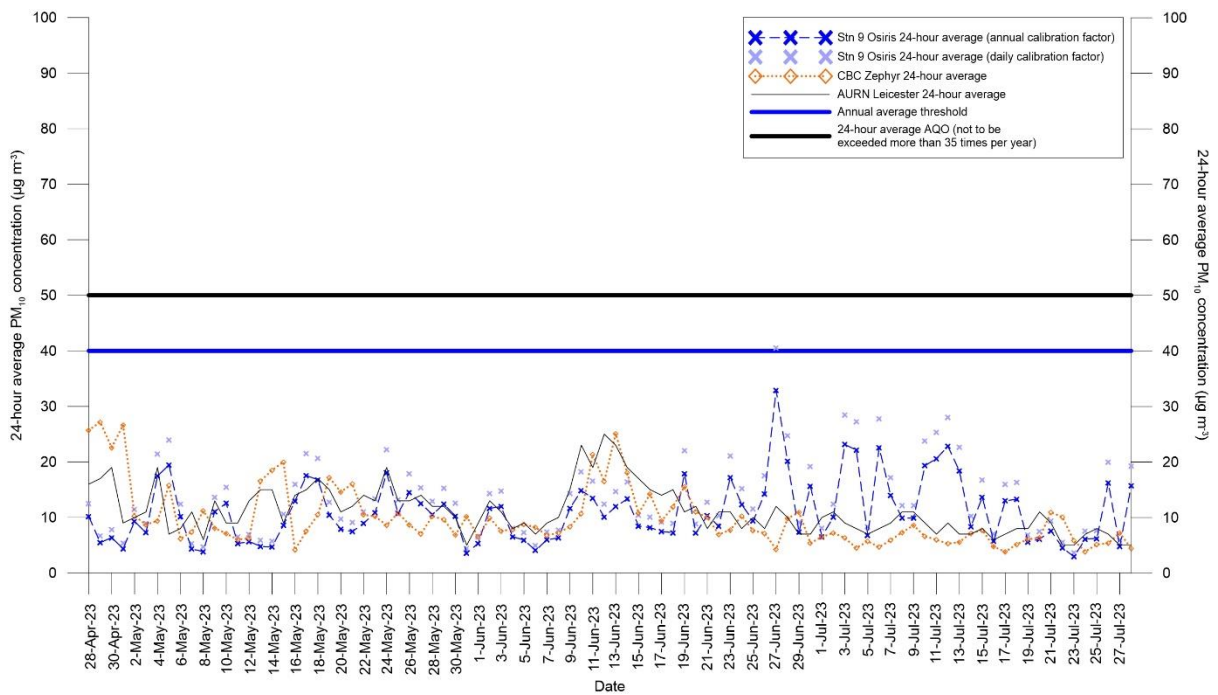


Figure 4: PM₁₀ data, most recent 3 months (up to 28 July 2023)

Between 29 June 2023 – 28 July 2023, no trigger emails alerting staff to high PM₁₀ levels from the direction of site operations were sent out.

The PM₁₀ data from the CBC Zephyr for this period are shown in orange in Figure 4. The data from this device typically corresponds relatively well with the AURN data from Leicester.

PM₁₀ concentrations recorded by the Osiris tended to be higher than those reported by the AURN station and the Zephyr. However there were short periods, notably late April, mid-May, mid-June and mid-July where concentrations reported by the Osiris were lower than those reported elsewhere.

Importantly, these discrepancies must be recognised as typical for different monitoring equipment, demonstrating that in many cases there can be no definitive data, just a range of indicative results which must be interpreted with great care.

Discussions are ongoing between Tarmac, DustScanAQ, CBC and LCC regarding the discrepancies between the different datasets and how they should be presented in these reports.

PM_{2.5}

With regard to numerical analysis of the PM_{2.5} data:

- For the 12 months up to 28 July 2023, there were 365 daily PM_{2.5} readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM_{2.5} concentration for the 12 months was 6.70 µg/m³, which is approximately 55.8 % of the interim annual average PM_{2.5} concentration objective (12 µg/m³) applicable from 31 January 2023.

As with PM₁₀ data, differences in the magnitudes of values recorded by the different instruments demonstrate the challenge in accurately measuring air quality indicators and the significance of expert interpretation of the data.

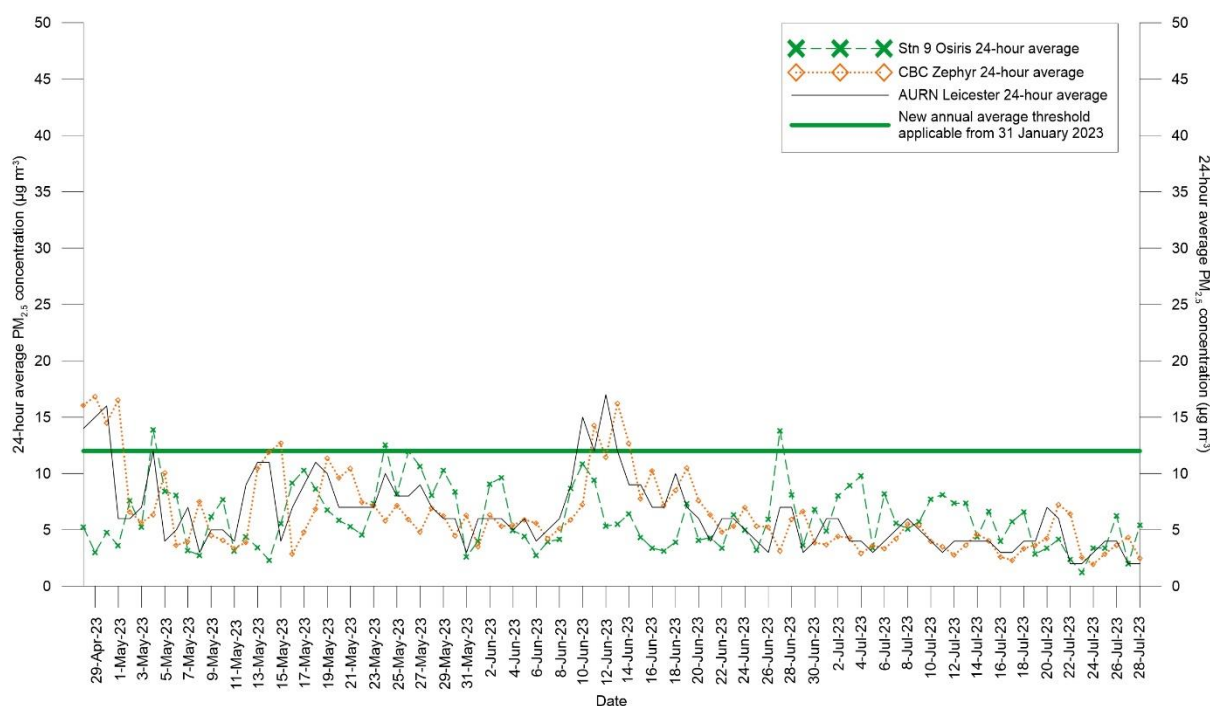


Figure 5: PM_{2.5} data, most recent 3 months (up to 28 July 2023)

Deposited dust monitoring summary

The deposited dust data for 29 June 2023 – 28 July 2023 are summarised in Table 2. The DMMP sets out a site-wide deposited dust threshold of 125 mg/m²/day ‘undissolved solids’ as a trigger limit for investigation to identify the potential dust source/s, taking account of the directional data.

Table 2 shows that, for the available data, deposited dust levels during 29 June 2023 – 28 July 2023 were within the site-wide threshold for all stations excluding Stn 1B where elevated levels (130 mg/m²/day) were recorded. Given the location of this monitor and the time of year, it is likely that this elevated level is related to agricultural activities, rather than on-site activities. Slightly Elevated levels (92, 91 and 97 mg/m²/day) were recorded at Stn 4A, Stn 9 and Stn 10, respectively. Low levels (69 and 52 mg/m²/day) were recorded at Stn 4B and Stn 11, respectively. All other stations recorded Very Low depositional magnitudes.

Table 2: Summary of deposited dust (undissolved solids), 29 June 2023 – 28 July 2023

Undissolved solids (mg/m ² /day)				
This month report start date:		29-Jun-23		
This month report end date:		28-Jul-23		
Receptor location	Nearest / appropriate dust monitoring point	Reported value	Trigger: ≥ 125 ^a	Magnitude ^b
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	35	No	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	21	No	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	130	Yes	Elevated
Mill Farm; Quorn House	Stn 3	16	No	Very Low
Woodside Farm, Leicester Road	Stn 4A	92	No	Slightly Elevated
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	69	No	Low
Bond Lane; Crown Lane	Stn 5	25	No	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	23	No	Very Low
Hawcliffe Road	Stn 9	91	No	Slightly Elevated
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	97	No	Slightly Elevated
Loughborough Road; River Soar (marina / caravan park)	Stn 11	52	No	Low
Meadow Farm Marina and Caravan Park	Stn 12	41	No	Very Low
Quorn House Park	Stn 13	15	No	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of mass deposition rate assessed against typical rate for semi-rural areas (30 - 80 mg/m²/day)

Regarding dust deposition over time, the rates across the sampling area have varied considerably. Trends in dust deposition rates (as undissolved solids) for the previous 12 months, together with the site-wide dust threshold are illustrated in Figure 6.

In general, as would be expected, dust deposition rates are typically lower in winter months than in summer months. This trend is clearly seen for most monitoring points in Figure 6, with some exceptions. Dust deposition rates have been consistently below the ‘trigger limit’ at all sampling locations except Stn 1B and 9, although the exceedances at Stn 1B are known to be related to nearby agricultural activities, rather than on-site processes.

In general, as shown in Figure 6, higher rates of dust deposition have been recorded near industrial settings (*i.e.* Stn 9) than in more residential areas (*e.g.* Stn 1, Kinchley Lane).

Figure 6 shows that dust deposition rates were largely well within the site-wide trigger level during the previous 12 months although rates at Stn 9 have been at or above the trigger level twice over this period and also twice at Stn 1B. At Stn 1B both exceedances are unlikely to be related to quarrying activities. The average dust deposition rate at Stn 9 for the previous 12 months (88 mg/m²/day) is below the site-specific threshold. It should be noted that due to contamination by insects, it had not been possible to process the depositional dust sample from Stn 9 for the period immediately before this one.

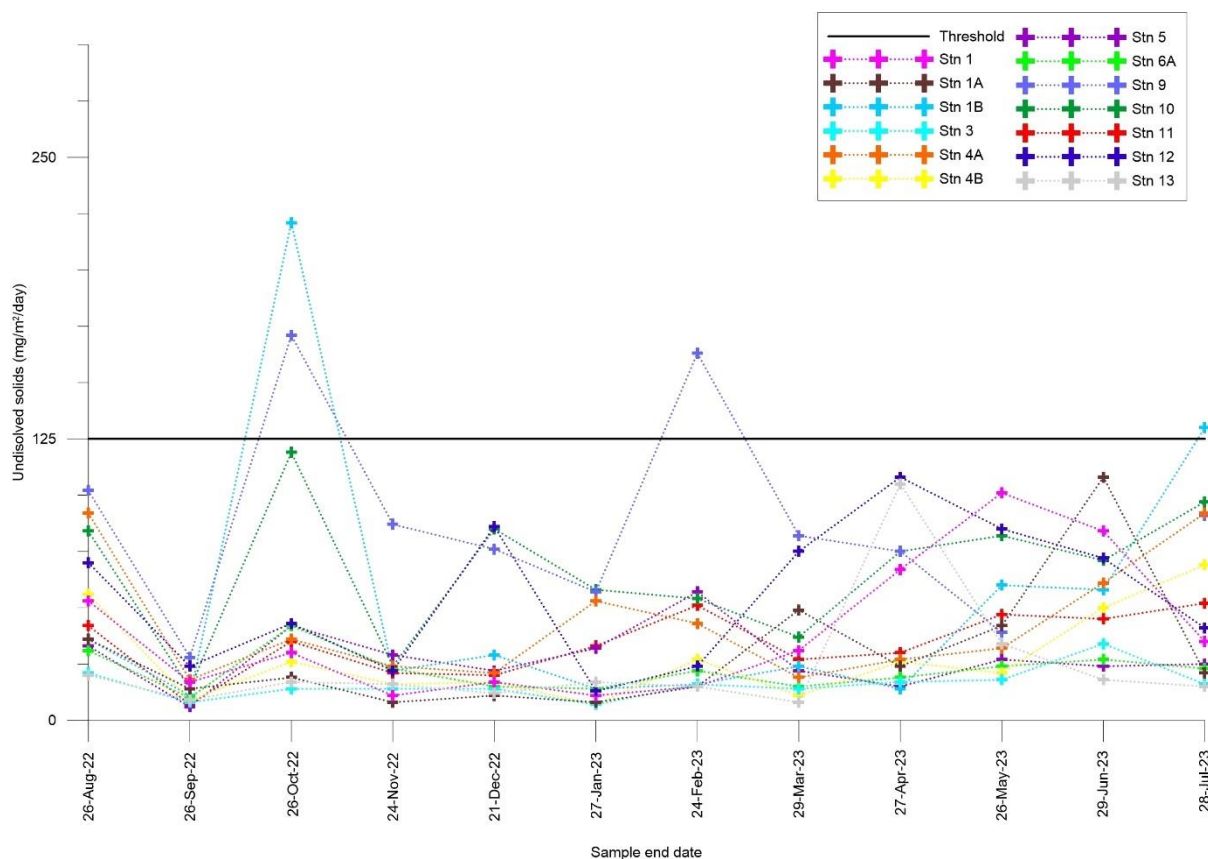


Figure 6: Dust deposition rates per sampling location over time (past 12 months)

Directional dust monitoring summary

The directional dust data for 29 June 2023 – 28 July 2023 are summarised in Table 3. As with deposited dust, the DMMP sets out a site-wide directional dust threshold. For directional dust soiling, 0.5 % effective area coverage (EAC) per day is a trigger limit for investigation to identify the likely dust source/s, again taking account of the direction.

Table 3 shows that during 29 June 2023 – 28 July 2023, most of the stations recorded Very Low dust levels from all directions. However up to Low levels (0.2 % EAC/day) were recorded at Stn 4A, Stn 4B, Stn 5 and Stn 10. Up to Moderate levels (0.4 % EAC/day) were recorded at Stn 6A and Stn 9.

Table 3: Summary of directional dust soiling, 29 June 2023 – 28 July 2023

		Directional dust soiling (%EAC/day) by direction (°)								
This month report start date:		29-Jun-23								
This month report end date:		28-Jul-23								
Receptor location	Nearest / appropriate dust monitoring point	Direction (°)								
		0	45	90	135	180	225	270	315	
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Reported value	0.1	0	0	0	0	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Reported value	0	0	0	0	0	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Reported value	0	0	0	0.1	0.1	0.1	0.1	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Mill Farm; Quorn House	Stn 3	Reported value	0	0	0.1	0.1	0.1	0.1	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Woodside Farm, Leicester Road	Stn 4A	Reported value	0	0	0	0	0.1	0.2	0.2	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Reported value	0.2	0.1	0.1	0	0.1	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Bond Lane; Crown Lane	Stn 5	Reported value	0.1	0	0	0.1	0.1	0.1	0.2	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	Reported value	0	0.2	0.4	0	0	0.3	0.1	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Low	Moderate	Very Low	Very Low	Low	Very Low	Very Low
Hawcliffe Road	Stn 9	Reported value	0.1	0.1	0.1	0.1	0	0.4	0.4	0.2
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Moderate	Moderate	Low
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Reported value	0.1	0	0	0.1	0.1	0.3	0.2	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Reported value	0.1	0	0	0.1	0.1	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	Reported value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn House Park	Stn 13	Reported value	0.1	0	0	0.1	0.1	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of directional dust soiling derived from Beaman and Kingsbury, 1981

^c Direction/s not determined for daily EAC below 0.1%/day (very low soiling)

Table 4 shows that average directional soiling rates have been at very low levels at most monitoring locations, for most directions, over the past year. At Stn 9, the annual average soiling rate to date was 0.2 % EAC/day from the southwest and west resulting in ‘Low’ magnitudes being recorded. The cause or causes of these consistently, but marginally elevated dust soiling rates at this monitoring point are under review, as they may be related to site activities such as operations at the PSV yard, Granite Way and/or the toast rack.

Stn 10, also recorded an annual average soiling rate to date of 0.2 % EAC/day from the southwest. This is most likely due to the ongoing construction work off Halstead Road.

Table 4: Running average directional dust soiling (past 12 months)

Receptor location	Nearest / appropriate dust monitoring point		Direction (°)							
			0	45	90	135	180	225	270	315
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Average value	0	0	0	0	0	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Average value	0	0.1	0	0	0	0	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Average value	0	0	0	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Mill Farm; Quorn House	Stn 3	Average value	0	0	0	0.1	0	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Woodside Farm, Leicester Road	Stn 4A	Average value	0	0.1	0	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Average value	0	0.1	0.1	0	0.1	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Bond Lane; Crown Lane	Stn 5	Average value	0	0	0	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	Average value	0	0.1	0.1	0	0	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Hawcliffe Road	Stn 9	Average value	0	0.1	0.1	0.1	0	0.2	0.2	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Average value	0.1	0	0	0.1	0.1	0.2	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Average value	0	0	0	0.1	0.1	0.1	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	Average value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn House Park	Stn 13	Average value	0	0	0	0	0	0	0	0.1
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DustScanAQ
September 2023



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August 2023 particulate matter, dust and weather monitoring report for Mountsorrel Quarry

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Report Start Date:	28 July 2023
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The DMMP is enacted through the quarry Site Improvement Plan (SIP). The SIP sets out a programme of actions to reduce the environmental impact of specific areas of the site operation.

¹ Statutory Instrument. (2023), 'The Environmental Targets (Fine Particulate Matter) (England) Regulations', No. 96. King's Printer of Acts of Parliament

Particulate matter, dust and weather monitoring

Particulate matter (in the form of PM₁₀ and PM_{2.5}) and weather are measured at one location each and deposited and directional dust are routinely measured at thirteen locations around Mountsorrel Quarry.

For particulate matter, a Turnkey Osiris sampler is currently located at Stn 9 (Hawcliffe Road). This recognised and certificated 'indicative' real-time device is connected to its own wind vane and anemometer and provides near-instantaneous directional PM₁₀ PM_{2.5} and PM₁ data directly to the quarry management team. Through the use of appropriate correction factors as agreed with CBC and LCC, data from the Osiris may be compared against the relevant Air Quality Objectives for particulate matter.

Charnwood Borough Council (CBC) operates a Zephyr air quality monitor which is located within the Leicestershire County Council (LCC) depot at the southern end of Hawcliffe Road, in close proximity to the Osiris device. This device measures a number of pollutants including PM₁₀ and PM_{2.5}.

A weather station is located at the site offices off Wood Lane and collects a range of weather parameters over fifteen minute intervals. Data from the weather station are available to the quarry management by means of a dedicated modem connection to the internet.

The majority of the dust samplers around Mountsorrel Quarry comprise the 'Frisbee-type' deposition gauge combined with an adhesive 'sticky pad' directional gauge. These samplers are used to monitoring 'nuisance' dust and samples from these instruments are collected on a monthly basis.

Key monitoring locations are set out in Table 1 and shown in Figure 1.

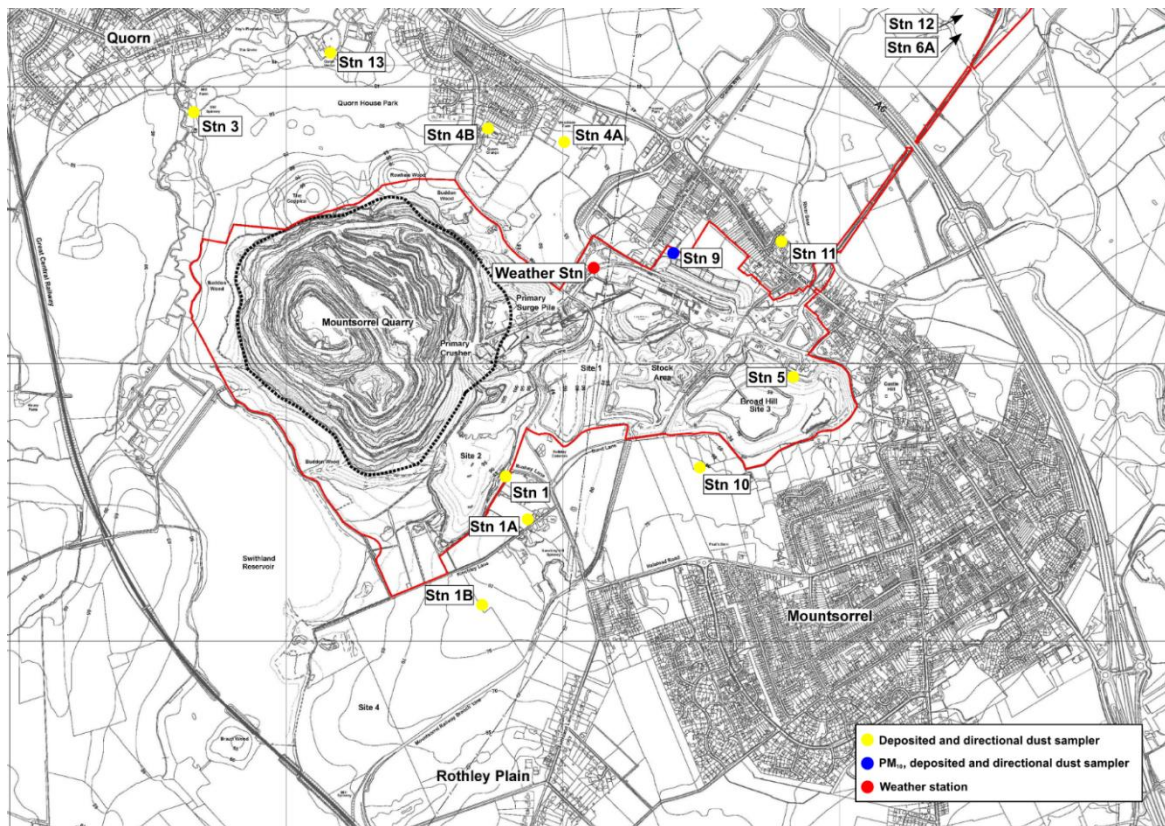


Figure 1: Particulate matter, dust and weather monitoring locations, Mountsorrel Quarry

Table 1: Weather station, PM₁₀ and dust monitoring locations, Mountsorrel Quarry

Sampler reference	Easting	Northing	Locality monitored
Stn 1	456781	314577	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1A	456891	314436	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 1B	456715	314109	Swithland Lane; Rushey Lane; Kinchley Lane
Stn 3	455681	315847	Mill Farm; Quorn House
Stn 4A	457000	315805	Woodside Farm; Leicester Road
Stn 4B	456733	315778	Quorn Grange, Unitt Road, Northage Close, Quorn Park
Stn 5	457789	314941	Bond Lane; Crown Lane
Stn 6A	458660	316786	Sileby Road; Huston Close; Sileby Road (commercial)
Stn 9 (inc. PM)	457374	315398	Hawcliffe Road
Stn 10	457487	314626	Glebe Close; Halstead Road (south); Halstead Road (north)
Stn 11	457791	315458	Loughborough Road; River Soar (marina / caravan park)
Stn 12	458575	315459	Meadow Farm Marina and Caravan Park
Stn 13	456158	316090	Northage Close, Meeting Street
Weather Station	457126	315376	Wood Lane Site Offices

Site Improvement Plan (SIP)

The SIP is updated regularly by quarry management, with support from DustScanAQ through site visits and reports and quarterly reviews with LCC and CBC.

Weather monitoring summary

The key weather data which might affect dust propagation (wind speed, wind direction, total daily precipitation and average daily temperature) for this reporting period are summarised in Figure 2 and Figure 3.

The period 28 July 2023 – 25 August 2023 is characterised by mild to warm temperatures. The maximum daily average temperature was 22.0 °C recorded on 10 August and the minimum daily temperature was 12.2 °C recorded on 05 August.

The monitoring period was generally dry with precipitation recorded on 59 % of the total days and the majority of the dry days occurred in the second half of the monitoring period. As a consequence there may have been increased potential for dust propagation during the dry periods.

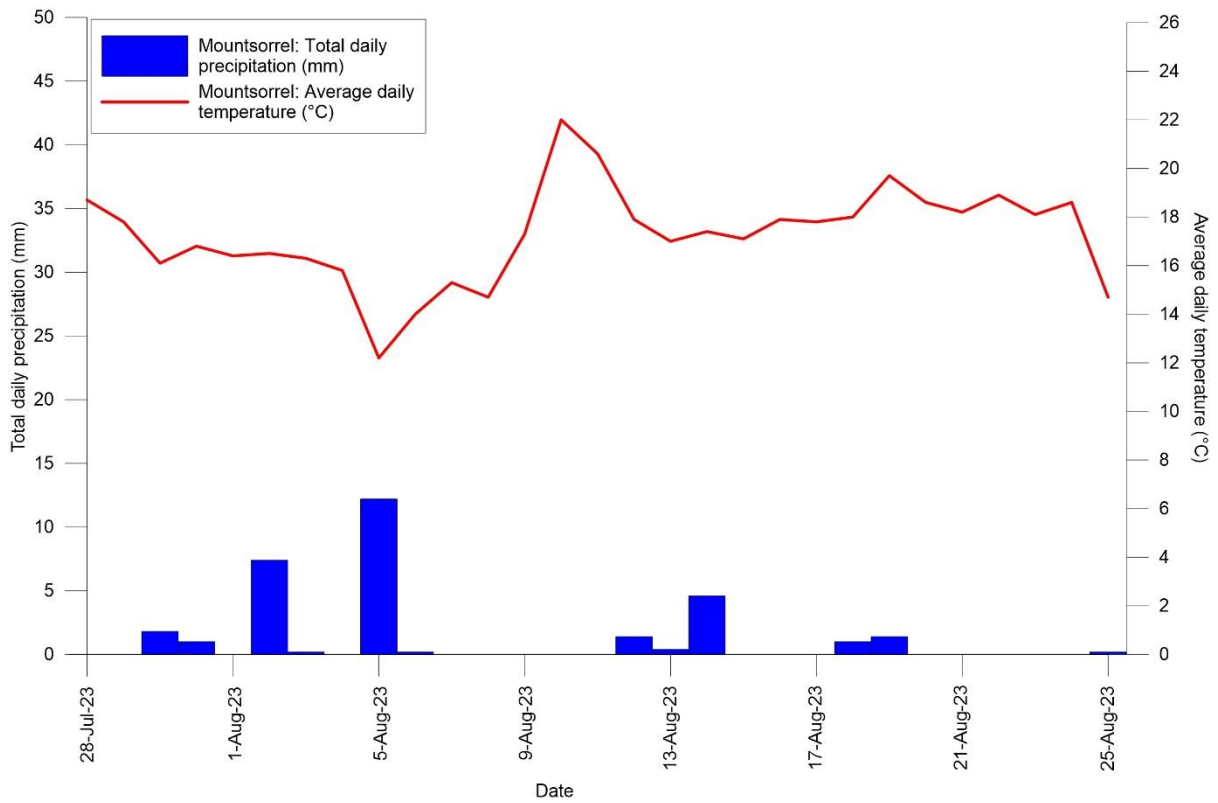


Figure 2: Total daily precipitation and average daily temperature, Mountsorrel Quarry, 28 July 2023 – 25 August 2023

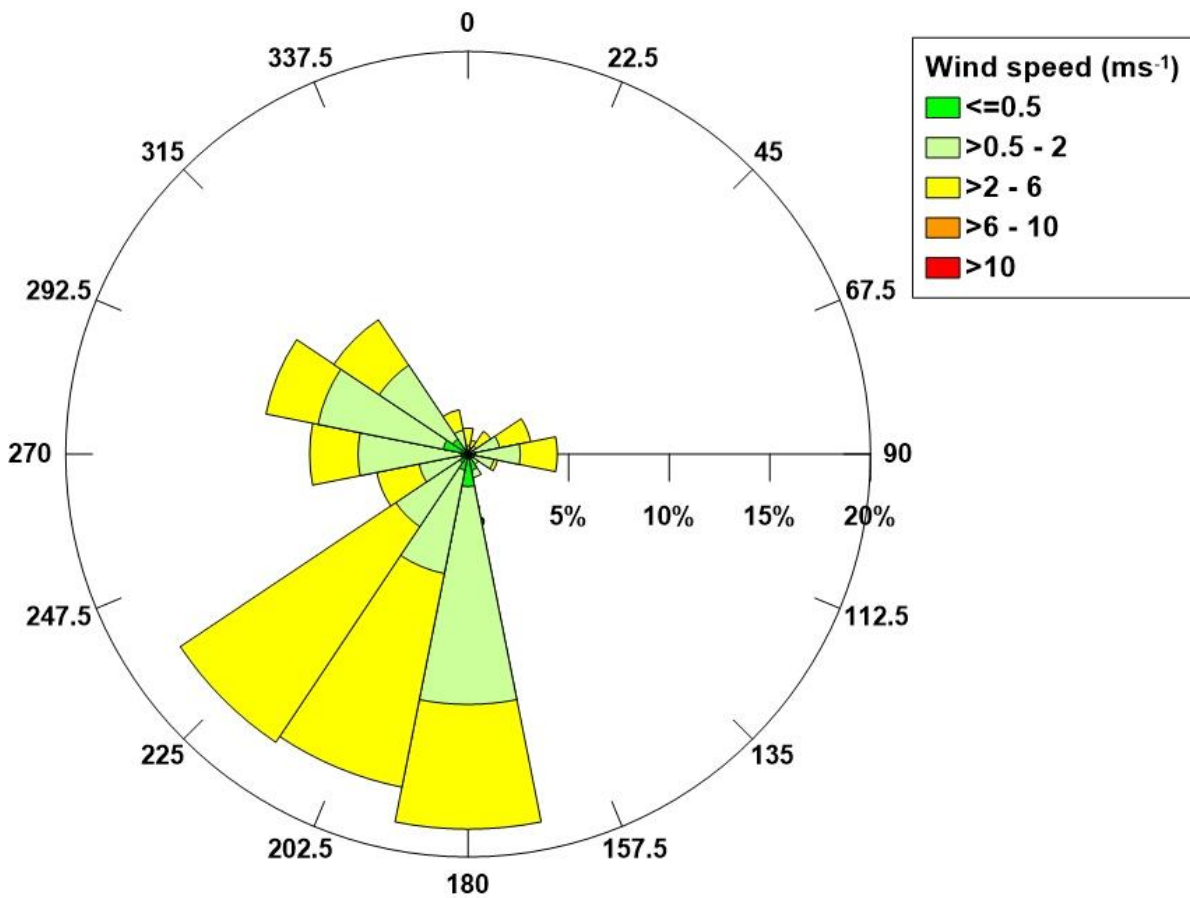


Figure 3: Wind rose, Mountsorrel Quarry, Mountsorrel, 28 July 2023 – 25 August 2023

As seen in Figure 3, winds for this monitoring period were predominantly moderate in speed (>2 – 6 m/s) and from the south and southwest. Consequently, there may have been a slight potential for dust propagation to the north and northeast.

PM₁₀ and PM_{2.5} monitoring summary

The available data from the past 3 months from the Osiris at Stn 9, together with data from the Defra Automatic Urban and Rural Network (AURN) station in Leicester University² are shown in Figure 4 and Figure 5.

Data from the AURN station are shown to consider correspondence with, or difference from, national air quality elsewhere in the UK. Where sufficient data are available, it is clear that PM₁₀ levels at all locations occasionally track each other closely, and during other periods there can be considerable variation between the units. These patterns are typically indicative of regional and local PM₁₀ and PM_{2.5} signals respectively.

PM₁₀

With regard to numerical analysis of the data:

- For the 12 months up to 25 August 2023, there were 365 daily PM₁₀ readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM₁₀ concentration for the 12 months to date (and using the annual calibration factor) was 17.78 µg/m³, which is approximately 44.5 % of the annual average PM₁₀ concentration objective (40 µg/m³); and
- For the 12 months up to 25 August 2023 there were 19 recorded instances where the daily average PM₁₀ concentrations (using the daily factor) exceeded 50 µg/m³. From the data collection rate this is equivalent to 19 days with a 24-hour average above 50 µg/m³ in a full year as the data collection rate was 100 %.

In summary, for the 12 months up to 25 August 2023 neither the annual nor daily AQO were exceeded.

Figure 4 shows that over the previous three months of monitoring up to the time of this report, there were no exceedances of the daily average threshold.

Details of past exceedances can be found in previous compliance reports.

² <http://uk-air.defra.gov.uk/networks/network-info?view=aurm>

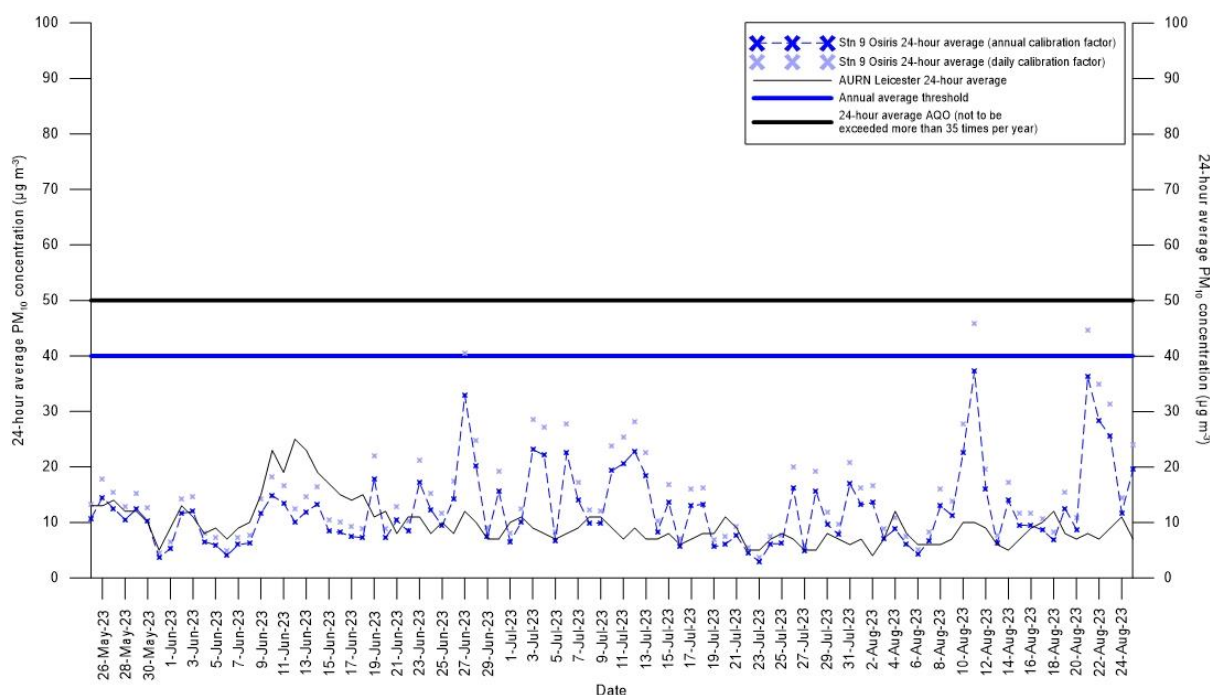


Figure 4: PM₁₀ data, most recent 3 months (up to 25 August 2023)

Between 28 July 2023 – 25 August 2023, trigger emails alerting staff to high PM₁₀ levels from the direction of site operations were sent out on five occasions. Details of the corresponding causes and investigations are provided in Table 2.

Table 2: Email alert responses, 28 July 2023 – 25 August 2023 (using the trigger threshold, 125 µg/m³ for the 15-minute average)

Date of alert	Details	Possible cause and investigation
31/07/2023	Exceedance recorded at 09:45 from the west-southwest	At the same time that the dust alert was generated, processing discovered an issue with no water for the bestchem dust suppression. Processing rectified immediately.
11/08/2023	Exceedance recorded at 15:15 from the west-southwest	Tractor/bowser breakdown
21/08/2023	Exceedance recorded at 12:45 and 14:00, both from the west-southwest	12:45 – Mechanical breakdown in processing created purge of dry material. Plant stopped immediately 14:00 – Hydraulic leak on water bowser
25/08/2023	Exceedance recorded at 16:15 from the west-southwest	Investigated by loadout supervisor. Reclaiming ballast into the toastrack, all dust suppression working correctly. Ground conditions wet, no specific source identified.

PM_{2.5}

With regard to numerical analysis of the PM_{2.5} data:

- For the 12 months up to 25 August 2023, there were 365 daily PM_{2.5} readings taken by the Osiris at Stn 9, representing a 100 % data collection rate. From the available data the annual average daily PM_{2.5} concentration for the 12 months was 6.73 µg/m³, which is approximately 56.1 % of the interim annual average PM_{2.5} concentration objective (12 µg/m³) applicable from 31 January 2023.

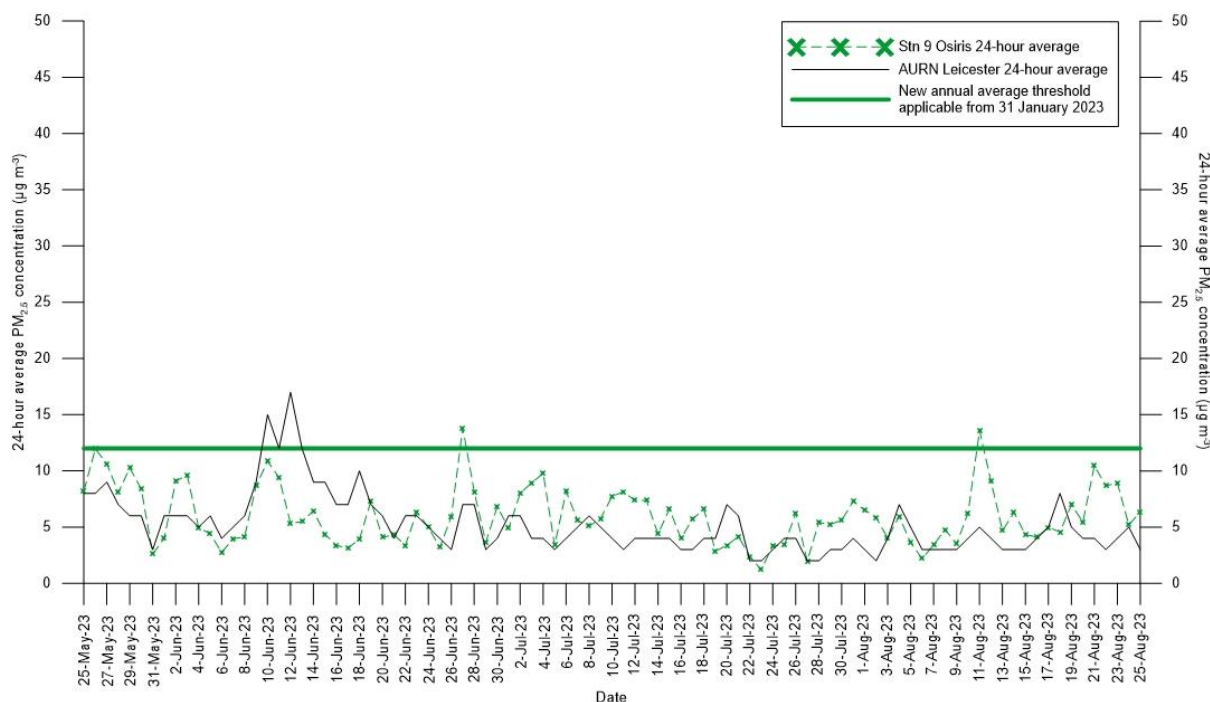


Figure 5: PM_{2.5} data, most recent 3 months (up to 25 August 2023)

Deposited dust monitoring summary

The deposited dust data for 28 July 2023 – 25 August 2023 are summarised in Table 3. The DMMP sets out a site-wide deposited dust threshold of 125 mg/m²/day ‘undissolved solids’ as a trigger limit for investigation to identify the potential dust source/s, taking account of the directional data.

Table 3 shows that, for the available data, deposited dust levels during 28 July 2023 – 25 August 2023 were within the site-wide threshold for all stations. Slightly Elevated levels (84, 107 and 104 mg/m²/day) were recorded at Stn 4A, Stn 4B and Stn 9, respectively. Low levels (72, 67 and 51 mg/m²/day) were recorded at Stn 1B, Stn 3 and Stn 10, respectively. All other stations recorded Very Low depositional magnitudes.

Table 3: Summary of deposited dust (undissolved solids), 28 July 2023 – 25 August 2023

Undissolved solids (mg/m ² /day)				
This month report start date:		28-Jul-23		
This month report end date:		25-Aug-23		
Receptor location	Nearest / appropriate dust monitoring point	Reported value	Trigger: ≥ 125 ^a	Magnitude ^b
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	34	No	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	20	No	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	72	No	Low
Mill Farm; Quorn House	Stn 3	67	No	Low
Woodside Farm, Leicester Road	Stn 4A	84	No	Slightly Elevated
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	107	No	Slightly Elevated
Bond Lane; Crown Lane	Stn 5	40	No	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	20	No	Very Low
Hawcliffe Road	Stn 9	104	No	Slightly Elevated
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	51	No	Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	47	No	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	49	No	Very Low
Quorn House Park	Stn 13	19	No	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of mass deposition rate assessed against typical rate for semi-rural areas (30 - 80 mg/m²/day)

Regarding dust deposition over time, the rates across the sampling area have varied considerably. Trends in dust deposition rates (as undissolved solids) for the previous 12 months, together with the site-wide dust threshold are illustrated in Figure 6.

In general, as would be expected, dust deposition rates are typically lower in winter months than in summer months. This trend is clearly seen for most monitoring points in Figure 6, with some exceptions. Dust deposition rates have been consistently below the ‘trigger limit’ at all sampling locations except Stn 1B and 9, although the exceedances at Stn 1B are known to be related to nearby agricultural activities, rather than on-site processes.

In general, as shown in Figure 6, higher rates of dust deposition have been recorded near industrial settings (*i.e.* Stn 9) than in more residential areas (*e.g.* Stn 1, Kinchley Lane).

Figure 6 shows that dust deposition rates were largely well within the site-wide trigger level during the previous 12 months although rates at Stn 9 have been at or above the trigger level twice over this period and also twice at Stn 1B. At Stn 1B both exceedances are unlikely to be related to quarrying activities. The average dust deposition rate at Stn 9 for the previous 12 months (88 mg/m²/day) is below the site-specific threshold.

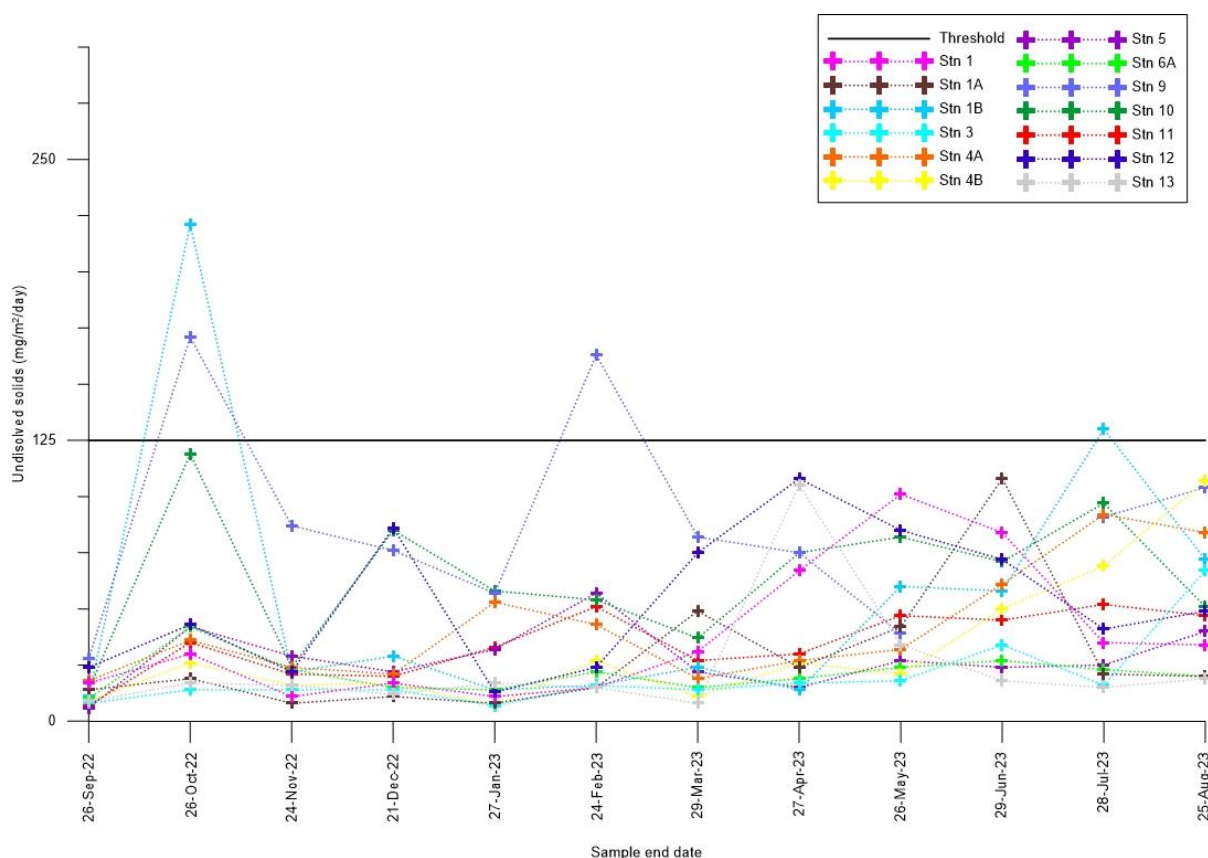


Figure 6: Dust deposition rates per sampling location over time (past 12 months)

Directional dust monitoring summary

The directional dust data for 28 July 2023 – 25 August 2023 are summarised in Table 4. As with deposited dust, the DMMP sets out a site-wide directional dust threshold. For directional dust soiling, 0.5 % effective area coverage (EAC) per day is a trigger limit for investigation to identify the likely dust source/s, again taking account of the direction.

Table 4 shows that during 28 July 2023 – 25 August 2023, most of the stations recorded Very Low dust levels from all directions. However up to Low levels (0.2 % EAC/day) were recorded at Stn 1B and up to Moderate levels (0.4 % EAC/day) were recorded at Stn 9.

Table 4: Summary of directional dust soiling, 28 July 2023 – 25 August 2023

Directional dust soiling (%EAC/day) by direction (°)										
This month report start date:		28-Jul-23								
This month report end date:		25-Aug-23								
Receptor location	Nearest / appropriate dust monitoring point	Direction (°)								
			0	45	90	135	180	225	270	315
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Reported value	0	0	0	0	0	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Reported value	0	0	0	0	0	0	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Reported value	0	0	0	0.1	0.1	0.2	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low
Mill Farm; Quorn House	Stn 3	Reported value	0	0	0	0	0	0	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Woodside Farm, Leicester Road	Stn 4A	Reported value	0	0.1	0	0	0	0.1	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Reported value	0	0.1	0.1	0.1	0.1	0	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Bond Lane; Crown Lane	Stn 5	Reported value	0.1	0	0	0	0	0	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Sibley Road; Huston Close; Sibley Road (commercial)	Stn 6A	Reported value	0	0.1	0.1	0	0	0.1	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Hawcliffe Road	Stn 9	Reported value	0	0.1	0.1	0.1	0	0.3	0.4	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Moderate	Very Low
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Reported value	0.1	0	0	0	0	0.1	0	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Reported value	0	0	0	0.1	0.1	0.1	0	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	Reported value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn House Park	Stn 13	Reported value	0	0	0	0	0	0	0.1	0
		Trigger: ≥ 0.5 ^a	No	No	No	No	No	No	No	No
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of directional dust soiling derived from Beaman and Kingsbury, 1981

^c Direction/s not determined for daily EAC below 0.1%/day (very low soiling)

Table 5 shows that average directional soiling rates have been at very low levels at most monitoring locations, for most directions, over the past year. At Stn 9, the annual average soiling rate to date was 0.2 % EAC/day from the southwest and west resulting in ‘Low’ magnitudes being recorded. The cause or causes of these consistently, but marginally elevated dust soiling rates at this monitoring point are under review, as they may be related to site activities such as operations at the PSV yard, Granite Way and/or the toast rack.

Table 5: Running average directional dust soiling (past 12 months)

Receptor location	Nearest / appropriate dust monitoring point		Direction (°)							
			0	45	90	135	180	225	270	315
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1	Average value	0	0	0	0	0	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1A	Average value	0	0	0	0	0	0	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Swithland Lane; Rushey Lane; Kinchley Lane	Stn 1B	Average value	0	0	0	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Mill Farm; Quorn House	Stn 3	Average value	0	0	0	0.1	0	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Woodside Farm, Leicester Road	Stn 4A	Average value	0	0.1	0	0	0.1	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn Grange, Unitt Road, Northage Close, Quorn Park	Stn 4B	Average value	0	0.1	0.1	0	0.1	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Bond Lane; Crown Lane	Stn 5	Average value	0.1	0	0	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Sileby Road; Huston Close; Sileby Road (commercial)	Stn 6A	Average value	0	0.1	0.1	0	0	0.1	0.1	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Hawcliffe Road	Stn 9	Average value	0	0.1	0.1	0.1	0	0.2	0.2	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Low	Low	Very Low
Glebe Close; Halstead Road (south); Halstead Road (north)	Stn 10	Average value	0.1	0	0	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Loughborough Road; River Soar (marina / caravan park)	Stn 11	Average value	0	0	0	0.1	0.1	0.1	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Meadow Farm Marina and Caravan Park	Stn 12	Average value	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Quorn House Park	Stn 13	Average value	0	0	0	0	0	0	0	0
		Magnitude ^b	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low

^a Trigger mass deposition and Effective Area Coverage rates as in Section 7.3, ZLFMS-AG008 Dust Management and Monitoring Plan (Updated), 2015

^b Magnitude of directional dust soiling derived from Beaman and Kingsbury, 1981

^c Direction/s not determined for daily EAC below 0.1%/day (very low soiling)

Complaints

During 28 July 2023 – 25 August 2023 two complaints relating to dust were received by the quarry. Each complaint was responded to in accordance with the process outlined in the DMMP.

DustScanAQ
October 2023