

*Contaminated Land
Air Quality
Environmental Audit*



Partnership No: OC 300776

**WASING ESTATE
PROPOSED SAND AND GRAVEL
EXTRACTION**

REVISED AIR QUALITY ASSESSMENT

For: Marley Eternit / Lafarge Aggregates

April 2012

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Proposed Sand and Gravel Extraction
Air Quality Assessment

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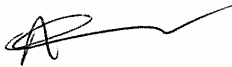
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	Name	Position	Signature	Date
Author	K Hawkins BSc MSc CEnv MIEMA	Partner		19.04.12
Checked	A F Smith BSc PhD MCIWM SiLC	Chairman		19.04.12

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AIR QUALITY ASSESSMENT

For: Marley Eternit / Lafarge Aggregates

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1 Introduction

- 1.1 Marley Eternit and Lafarge Aggregates Ltd propose the extraction of sand and gravel at an area of land, Wasing Estate, located between Aldermaston and Woolhampton, Berkshire. Smith Grant LLP (SGP) previously prepared an airborne dust assessment of the proposed sand and gravel quarry on behalf of Lafarge Redland Aggregates Ltd (ref: R392-R01, July 2000) in support of an Environmental Statement submitted for an earlier planning application.
- 1.2 This following report updates and supplements the previous assessment taking into account changes to the proposed working methods and extraction areas. The revised assessment also incorporates an assessment of the potential impacts of emissions from HGV movements associated with the development.

2 Technical and Legislative Context

2.1 Public Health

- 2.1.1 The protection of public health with respect to quarry and related process emissions is provided by means of the Air Quality Strategy (AQS) and associated regulations, along with specific emissions standards applicable to any Environmental Permits to be provided for the site where particular processes will be carried out. The Air Quality Regulations (AQR) prescribe air quality objectives to be achieved for a range of key pollutants. Local authorities are required to review the existing and projected airborne concentrations of these pollutants. If exceedance of any AQS objective appears likely then an Air Quality Management Area (AQMA) must be declared with the aim of achieving the objective by the specified date.
- 2.1.2 The pollutants of principal concern in connection with quarrying and associated activities, including road transport, for which the AQS objectives have been established for nitrogen oxides (NO_x), nitrogen dioxide (NO₂) and particulate matter with a size of less than 10 µm (PM₁₀).
- 2.1.3 The AQS objectives for these pollutants are detailed below:

Table 2.1: AQS Objectives

pollutant	objective	date	comment
NO ₂	40 µg/m ³ , annual mean	31 December 2005	
	200 µg/m ³ , hourly mean, not to be exceeded more than 18 times per annum	31 December 2005	
NO _x	30 µg/m ³ , annual mean	31 December 2000	protection of vegetation and ecosystems
PM ₁₀	40 µg/m ³ , annual mean	31 December 2004	
	50 µg/m ³ , 24 hour mean, not to be exceeded more than 35 times per annum	31 December 2004	
PM _{2.5}	25 µg/m ³ , annual mean	2020	new, not legally binding
	15% reduction, urban background	2010 - 2020	target, UK urban areas

2.1.4 Technical guidance is provided to English local authorities in implementing their local air quality management duties by DEFRA.¹ The local authority responsible for local air quality monitoring and management is West Berkshire Council (WBC).

2.2 Dust Deposition

2.2.1 Coarse particulates (>10 µm) arising from fugitive dust from quarrying operations can give rise to nuisance, where nuisance is defined as *'any **dust**, steam, smell or other effluvia arising on industrial or trade or business premises and being prejudicial to health or a nuisance'* under the Environmental Protection Act 1990 Part III. There are no UK statutory or recommended levels of dust deposition which constitute an acknowledged nuisance. Public concerns in relation to dust include the rate of deposition and / or the level of resultant dustiness. Nuisance may be alleged when the dust coverage on surfaces is visible in contrast with other cleaner areas, especially if the coverage occurs regularly. Severe nuisance is likely to be alleged when dust is perceptible without reference to a clean surface. Complaints about dust may occur when the monthly deposition rate is about 2.5 times the median rate, and are likely if the monthly rate is about 3.5 times the median rate².

2.2.2 Previously, some Mineral Planning Authorities (MPAs) have accepted a deposition rate of 200 mg/m²/day as a default guideline for residential areas and at the edge of towns, above which level the need for cleaning is said to become excessive.

¹ DEFRA Local Air Quality Management Technical Guidance LAQM.TG[09], February 2009

² Vallack HW and Shillito DE, 1998, *Suggested Guidelines for Deposited Ambient Dust*, Atmospheric Environment **30**, pp2737-2744

2.2.3 The onset of potential nuisance due to soiling is generally considered to occur when the daily effective area coverage exceeds 0.5% at a sensitive property. The effective area coverage (EAC) is a measure of the degree of soiling visible to the eye, and will depend on the quantity of dust and its colour which will determine visibility on a surface.

2.3 Planning Controls

2.3.1 Guidance to MPAs is set out in a series of Minerals Policy Statements, with details with respect to environmental effects outlined in MPS2³. Modern planning consents for surface mineral workings and associated processes feature conditions to prevent or control environmental impacts. Invariably, these now include conditions relating to airborne dust, in accordance with guidance provided in Annex 1 of MPS2. Although a deposition rate has been suggested below which it is unlikely that dust will constitute a nuisance, current guidance is to the effect that it is inadvisable to set definitive standards or guidelines by condition. The essence of the guidance is the control of emissions through good site management.

2.3.2 Accordingly, it is the practice of MPAs to set conditions relating to the control of dust at source. Typically these include a requirement to submit for approval a scheme of measures for the management of dust emissions. MPAs may also require the submission of a programme for monitoring dust emissions.

2.4 Pollution Control

2.4.1 The extraction processes to be carried out at Wasing Estate do not include potentially polluting activities that fall within the Environmental Permitting regime, for example size-reduction of minerals (crushing) or concrete batching. An Environmental Permit will be required in respect of the inert filling operations during the restoration works. Environmental Permits relating to waste management typically include conditions addressing air quality including dust emissions. During the period of the licence the Environment Agency (EA) will ensure that the licenced activities are carried out in accordance with the conditions and do not cause nuisance, pollution of the environment or harm to human health.

2.5 Environmental Management System (EMS)

2.5.1 Lafarge has implemented an accredited EMS across all of the company's UK sites, and which will be implemented at the Wasing Estate site. The control of dust and air quality impacts forms an integral part of the EMS. This accords with PGN 3/8 (04) which notes the desirability of a structured approach to environmental management.

³ Office of the Deputy Prime Minister (ODPM), Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, 2005

3 Methodology

3.1 Scope of the Assessment

3.1.1 The assessment has been undertaken in accordance with the framework outlined in current guidance for minerals and related operations⁴. The principal aspects identified as requiring consideration during the assessment were:

- **fugitive dust emissions:** nuisance dust and fine particulate matter (PM₁₀) arising during construction and operational phases;
- **vehicle exhaust emissions:** potential impacts of HGV exhaust emissions (NO₂ and PM₁₀) on local air quality during the operation phase.

3.1.2 The mineral planning authority is West Berkshire Council. In undertaking the revised air quality assessment, SGP undertook the following activities:

- site visit to view the proposed site,
- walkover of the surrounding area to confirm the current site setting,
- site visit to nearby, similar operations at Midgham Quarry,
- review of baseline air quality and weather conditions,
- assessment of dust and traffic emissions,
- provision of recommendations for mitigation, and
- assessment of residual effects.

3.1.3 The site visit was undertaken by K Hawkins, Partner, SGP on 16th August 2011. The weather was dry, warm and slightly breezy with some cloud cover.

Nuisance Dust

3.1.4 A semi-qualitative assessment of the impacts of fugitive dust on potentially sensitive receptors has been undertaken taking into account meteorological data, topography, site activities, screening and proximity to receptors.

Road Traffic Emissions

3.1.5 The impact of traffic emissions has been assessed using Version 1.03 of the Design Manual for Roads and Bridges (DMRB) screening model which has been developed to predict the distribution of key pollutants from vehicles. The use of the model is recommended in DEFRA guidance provided to Local Authorities in undertaking air quality assessments⁶.

⁴ OPDM: Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Appendix C: Dust Assessment

3.2 Identification of Receptors

3.2.1 The assessment has predicted air quality impacts upon a range of representative receptors. In identifying potential receptors to be considered in the assessment reference has been made to Environment Agency⁵ and DEFRA⁶ guidance. Potential receptors have been considered on the following basis:

Table 3.1: Identification of Receptors

Human Receptors	
Houses / groups of houses	identified based on distance from site boundaries, operational areas and haulage distances, sensitivity and likely duration of exposure
Schools, hospitals, shops, factories	
Public rights of way, recreational areas	
Allotments	
Conservation Sites	
SPAs, SACs and RAMSAR sites	within 1 km of site boundaries
SSSIs, National Nature Reserves, Local Nature reserves, local wildlife and ancient woodland	

Nuisance Dust

3.2.2 The impact of fugitive dust at a receptor will depend on the inherent sensitivity of the receptor and the perception of the acceptability of the effects of dust. Receptors may vary in their sensitivity to nuisance dust as follows:

Table 3.2: Sensitivity of receptors to nuisance dust (MPS2)

sensitivity		
high	medium	low
hospitals and clinics	schools	farms
retirement homes	residential areas	light and heavy industry
hi-tech industries	food retailers	outdoor storage
painting and furnishing	glasshouses and nurseries	
food processing	horticultural land	
painting and furnishing	offices	

3.2.3 Large dust particles, which make up the greatest proportion of dust emitted from mineral workings (>30 µm), will largely deposit within 100m of the source. Intermediate sized particles (10-30 µm) may travel up to 200-500m. Adverse impacts due to fugitive dust from surface mineral sites are therefore uncommon at distances greater than 250m from the source and, as advised in MPS2, residents concerns are most likely to be experienced within 100m of the dust source. As the proposed activities at the site do not include any processing operations the dust assessment only considers potential receptors within 250m of the application site.

⁵ Environment Agency Horizontal Guidance Note EPR-H1 Environmental Risk Assessment, March 2008

Road Traffic Emissions

3.2.4 For AQS pollutants sensitive receptors are defined as those where members of the public are regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. For buildings the location of relevant exposure is taken as the building façade nearest to the source.

3.2.5 The DMRB model for assessment of air quality impacts from traffic indicates that only properties within 200m of the source are considered relatively vulnerable. The assessment of traffic emissions therefore only considers potential receptors within 200m of the site entrance and key road access network.

3.3 Significance Evaluation Methodology

3.3.1 A range of approaches and methods are described in the guidance for determining whether air quality effects of a development are significant. The significance evaluation methodologies for nuisance dust and road traffic emissions are derived from relevant DEFRA (TG09), EPUK⁷, IAQM⁸ and ODPM (MPS2) guidance.

Nuisance Dust

3.3.2 For fugitive dust emissions the assessment for each representative receptor takes into account the likely activities and duration, distance over which impacts may occur, degree of screening afforded at the time, and long-term frequency of wind directions.

3.3.3 The probability that dust, and wind blown dust, will be carried towards receptors is based upon the frequency of winds, as follows:

Table 3.3: Indicative Estimate of Probability of Nuisance Dust Impact

probability of impact	frequency of winds blowing towards receptor
negligible	<5%
low	5-10%
medium	10-20%
high	>20%

3.3.4 The magnitude of potential impacts is estimated by reference to the level of screening by vegetation, bunds etc., together with judgements of the emission strength and distance to the receptor; screening effects are estimated as follows:

⁶ Local Air Quality Management Technical Guidance LAQM.TG[09]: DEFRA (February 2009)

⁷ EPUK: Development Control: Planning for Air Quality (2010 Update)

⁸ IAQM: Position on the Description of Air Quality Impacts and the Assessment of their Significance, 2010

Table 3.4: Indicative Estimate of Magnitude of Nuisance Dust Impact

	source - receptor distance			
Screening	0-100m	100-250m	250-500m	>500m
no screening	large	medium	small	small / imperceptible
partial screening	medium	small	small / imperceptible	imperceptible
full screening	small	small / imperceptible	imperceptible	imperceptible

3.3.5 The impact significance for each receptor is assessed taking into account the probability of impact and magnitude of impact, as detailed below:

Table 3.5: Impact Significance Matrix for Nuisance Dust

probability of impact	impact magnitude - change in concentration (adverse)			
	large	medium	small	imperceptible
high	substantial	moderate	slight	negligible
medium	moderate	moderate	slight	negligible
low	slight	slight	negligible	negligible
negligible	slight	negligible	negligible	negligible

Note: risk matrix derived from guidance provided by EPUK and IAQM

3.3.6 Once the impact has been described at each specific receptor the overall significance of the air quality impacts is assessed. The overall assessment takes into account a number of aspects, including the number of properties / people affected, potential duration of the impact, and the nature of the source.

Fine Particulate and Nitrogen Dioxide Emissions

3.3.7 The magnitude and significance of the potential effects of PM₁₀ emissions from traffic or general quarry activities upon air quality are assessed through reference to guidance issued by the IAQM and EPUK. The guidance provides an approach for defining the magnitude of changes and describing the air quality impacts at specific receptors, and is also used for NO₂ with respect to quarry traffic.

3.3.8 The magnitude of an impact at a receptor is described as follows, based on the change in concentration of a pollutant brought about by the scheme as a percentage of the assessment level:

Table 3.6: Definition of Impact Magnitude

magnitude of impact	description
large	increase / decrease in predicted concentration > 10% of the assessment criterion
medium	increase / decrease in predicted concentration 5 – 10% of the assessment criterion
small	increase / decrease in predicted concentration 1 – 5% of the assessment criterion
imperceptible	increase / decrease in predicted concentration <1% of the assessment criterion

Note: the use of 1% criterion for an 'imperceptible' change is consistent with the screening method described by the EA in their H1 Risk Assessment Guidance

3.3.9 The probability of impact is assessed on comparison of the resulting predicted concentration with the concentration with or without the scheme as follows:

Table 3.7: Probability of Impact

probability of impact	description – absolute concentration in relation to objective / limit value
	increase / decrease with scheme
high	above objective / limit value <i>with / without</i> scheme
medium	just below objective / limit value <i>with / without</i> scheme (90-100% of the assessment level)
low	below objective / limit value <i>with /without</i> scheme ($\leq 75\%$ of the assessment level)
negligible	well below objective / limit value <i>with / without</i> scheme

3.3.10 The predicted impact at each relevant receptor is assessed taking into account the probability of impact and the magnitude of impact as detailed above in the preceding Table 3.5.

3.3.11 Once the impact has been described at each specific receptor the overall significance of the air quality impacts is assessed. This takes into account a number of aspects, including but not limited to, the number of properties / people affected; whether or not an exceedance of an objective or limit value is predicted; the extent to which an objective or limit value is exceeded and the degree of uncertainty.

4 Baseline Conditions

4.1 General Site Setting

4.1.1 The site is located in a rural setting with the village centres of Aldermaston 412m to the southeast, and Woolhampton 600m to the northwest beyond the River Kennett. Arable farmland land lies to the immediate east, west and south of the site. To the north lie wetlands associated within the floodplain around the confluence of the River Kennett to the north and the River Enbourne which bisects the site. To the south beyond Wasing Lane, lies Wasing Park, and to the west, beyond Station Road, lies an area of previous sand and gravel extraction, Woolhampton Quarry. Scattered residential properties lie in the vicinity of the site as detailed in Section 6 and shown on Drawing D01.

4.1.2 The A340 Basingstoke Road runs northeast-south to the immediate east of the site and the A4 runs east-west 285m to the north of the site beyond the River Kennett.

4.1.3 The site occupies gently undulating agricultural land currently primarily under arable uses. The fields are generally large and open, with boundary hedges, and scattered trees or copses. An airstrip is located in the southern part of the estate boundary.

4.1.4 Footpath FP10 runs at present in a southeast direction from Station Road across the western part of the site towards Wasing Lower Farm.

4.2 Wind Speed and Direction

4.2.1 Wind roses for the Meteorological Office weather station at Heathrow, which lies about 50 km to the northwest of the site, and forms the closest appropriate weather station, for the period January 1986 to December 1995, are attached as Appendix A. Given the relatively undeveloped nature of the area surrounding the site the data is considered appropriate. The wind roses depict percentage wind speeds and directions for the whole year and for the summer season when conditions tend to be drier and therefore potentially dustier. Data derived from the wind roses are summarised in the following table.

Table 4.1 Summary Wind Data, Heathrow

Direction	Annual percentage occurrence		Summer percentage occurrence	
	All winds	Winds >10 knots	All winds	Winds >10 knots
N	11	1	12	0
NE	9	2	8	1
E	7	1	6	2
SE	6	1	4	0
S	15	3	14	2
SW	23	6	25	5
W	16	2	18	2
NW	9	1	11	0
Calm / Variable	2	-	2	-

Note: Annual "All winds" % occurrence does not total 100 due to rounding

4.2.2 The data show that, as an annual average, winds predominate in an arc from the south to the west, accounting for 54% of all winds.

4.2.3 Winds greater than 10 knots (5 m/s) blow from the south to west for 11% of the time annually. Wind speeds in excess of 10 knots are important as the onset of potentially significant airborne dust emissions due to wind-raising of loose dry dusts from bare ground and stockpiles.

4.2.4 During the summer months, taken as June to August, the wind distribution skews further towards the west with a corresponding reduction in winds from the east. There is a small reduction in the frequency of winds greater than 10 knots, with those from the southwest quadrant blowing for 9% of the season.

4.3 Air Quality Review

4.3.1 Reference has been made to the reports prepared by WBC in fulfilment of the Local Air Quality Management (LAQM) reporting requirements, including the 2009 Air Quality Updating and

Screening Assessment. WBC has not declared any AQMAs in the vicinity of the site or road access network.

4.4 Interpolated Airborne Pollutant Concentrations

4.4.1 The mapped LAQM background data for 2011 for the grid squares covered by the quarry and access roads are summarised in the following table:

Table 4.2: Summary Background Air Quality Data

Location	NGR	Mean pollutant concentration ($\mu\text{g}/\text{m}^3$)			
		NO ₂	NO _x	PM ₁₀	PM _{2.5}
		2011	2011	2011	2011
west	457500 165500	8.9	11.6	15.1	9.1
northwest	457500 166500	10.4	13.9	15.3	9.4
east + access	458500 165500	9.3	12.2	15.4	9.2
northeast	458500 166500	10.5	14.0	15.0	9.4
average		9.8	12.9	15.2	9.3
% AQS objective		24.4%	43.0%	38.0%	37.2%

4.4.2 The data indicate that in 2011, the key pollutant concentrations are all predicted to be substantially less than the respective AQS mean objectives.

4.5 Monitored Air Quality

4.5.1 WBC carries out diffusion tube monitoring for NO₂ at 33 locations within the district and at one automatic monitoring site within Newbury. The nearest monitoring to the site is undertaken at 37 The Street, Aldermaston (NGR: 459102 165126) as shown on Drawing D01 and provides the only monitoring data within the vicinity of the site and associated transport routes. No monitoring for NO₂ is undertaken along the proposed HGV transport route to the north of the site. This monitoring location represents a 'roadside' location being 1.25m from the nearest kerb. Annual average NO₂ results for 2009 and 2010 (bias adjusted) were 25.45 $\mu\text{g}/\text{m}^3$ and 25.83 $\mu\text{g}/\text{m}^3$, both below the air quality objective⁹.

4.5.2 Monitoring of PM₁₀ is not undertaken within the district.

4.6 Dust Deposition

4.6.1 Typical dust deposition rates range from 10 to 50 $\text{mg}/\text{m}^2/\text{day}$ in rural areas, 30 to 80 $\text{mg}/\text{m}^2/\text{day}$ in suburban areas and 80 to 160 $\text{mg}/\text{m}^2/\text{day}$ in town centre or industrial areas.

4.6.2 The site setting is rural, with a trunk road to the east. The surface soils are generally sandy and will be potentially dusty during dry weather. Potential dust sources in the area include the busy

⁹ West Berkshire Council, data provided by WBC

transport corridor to the east and agricultural operations on the light soils. These factors suggest that dust deposition rates in the area may lie in the middle of the above range, i.e. about 30 mg/m²/day. In accordance with Section 2.2 therefore nuisance due to dust could arise if dust deposition exceeding about 70-100 mg/m²/day were to occur on a sustained basis at a neighbouring property.

4.7 Other Activities

4.7.1 Apart from agriculture, and traffic on the A340, no other potentially significant sources of air pollutants have been identified in the vicinity of the site.

5 Proposed Development

5.1 General Site Description

5.1.1 Full descriptions of the quarrying and associated processes are provided in the planning application and only those aspects of relevance to dust and air quality are described here.

5.1.2 The site office, welfare facilities, car park and weighbridge will be established in the eastern part of the site and will be accessed via an internal hard surfaced road from the A340.

5.1.3 The quarry will be worked in three phases over a period of about 12 years with a further 4 years to complete restoration by infilling. The anticipated output is 200,000 tonnes per year. Prior to mineral extraction surface soils will be stripped and used to create screen banks on some of the perimeters of the extraction areas. Extraction will commence in Phase A in the southwest corner of the site and progress to Phase B in the north and then Phase C in the east. The total extraction area amounts to about 46.5ha. In order to maintain operations through the winter period, small parts of Phase A will be active each year beyond the principal working / infilling period.

5.1.4 Existing footpaths across the site will be temporarily diverted.

5.1.5 The soils and overburden average about 1.3m in depth and the mineral deposit ranges up to 4.3m in depth. The deposit comprises generally silty sand and gravel with occasional substantial lenses of peat, silt and clay. In Phases B and C the water level typically lies within 1m of the ground surface and dewatering will be necessary during mineral operations.

5.1.6 Soils, overburden and mineral will be excavated by hydraulic excavator directly loading articulated dump trucks. Where necessary, the workings will be de-watered by pumping in advance of the extraction. Occasionally excavated mineral will be temporarily stockpiled on site awaiting off-site transportation.

- 5.1.7 There will be no processing plant operational at the quarry in association with this application.
- 5.1.8 Restoration to agriculture (Phase A) will be carried out immediately behind the excavation face by filling with overburden and imported inert materials and replacing the soils to original ground levels. Phase B will be restored to agriculture and a lake with wet grassland and Phase C to agriculture. Reclamation material is tipped directly from articulated lorries into the void and then spread and compacted by a small bulldozer.
- 5.1.9 Aggregates will be distributed by road transport and access to the quarry is to be at a new access point off the A340 Basingstoke Road. A fully surfaced road will provide access to the weighbridge. It is estimated that there will be approximately 80 vehicle movements a day (40 in / 40 out) for mineral extraction, and a similar number for infill. All HGV vehicles departing the site with mineral will travel northwards on the A340 to the A4 via Aldermaston Wharf and thence to Beenham. It is anticipated that at least 50% of HGV movements will be on a back-haul basis resulting in a total 120 movements per day (60 in / 60 out). The remaining 50% of infill HGV movements are expected to be from the south via Aldermaston resulting in 40 movements (20 in / 20 out) via this route.

6 Assessment of Impacts – Airborne Dust

6.1 General Observations

- 6.1.1 Airborne dust occurs when fine particles are disturbed and loosened by physical activity such as breaking, excavating, loading, tipping and transport, or by an airstream passing over such materials. Dust is defined as having particles sizes in the range 1 to 75 µm. Wind speeds greater than 10 knots (~5 m/s) across loose fine materials can cause windblown dust emissions.
- 6.1.2 Light winds will transport fine particles already suspended in the atmosphere due to disturbance. In calm conditions, any raised dust tends to settle out in the vicinity of the source. In windier conditions, the dust may be carried for a greater distance before settling out. The distance the dust will be carried depends on the wind speed, the particle size, the topography of the site and its surroundings.
- 6.1.3 Guidance for the minerals industry¹⁰ states that large dust particles, greater than 30 µm, which constitute the greatest proportion of dust emitted from mineral workings will largely deposit within 100m of the source. Finer particles, which constitute a small proportion of the dust emitted from most operations, are only deposited slowly, although their concentrations decrease

¹⁰ *The Environmental Effects of Dust from Surface Mineral Workings*, DoE, 1995

rapidly from the source due to dispersion and dilution. It is however uncommon for adverse impacts due to dust from sand and gravel quarries, or associated processes, to be experienced at distances greater than 250m from the source.

6.2 Sources of Dust

6.2.1 The principal potential sources of airborne dust associated with the quarrying operations at Wasing Estate include:

- soils stripping, storage and restoration,
- overburden excavation, storage and restoration,
- mineral excavation and handling,
- loading and tipping,
- site haulage,
- road transport,
- wind blow across bare ground and stockpiles,
- inert waste handling.

6.2.2 Stripping, stockpiling and replacing soils will be required to be carried out when the soils are friable. The soils in the area are silty and potentially dusty. Dust emissions could therefore be generated, and these could have an adverse effect when operations take place close to, and the wind blows towards, the site boundaries. However the duration of any impacts will be reduced by the need to strip or restore only a small area at any one time and will be short-lived within any locality. Dust emissions from soil stripping are unlikely to be significantly different in terms of potential dust generation compared to agricultural operations such as cultivation and harvesting.

6.2.3 The overburden is sandy but heavier and generally more cohesive than the soils. Consequently, dust emissions will tend to be less significant. The silt, clay and peat lenses within the mineral deposits will be naturally moist and will be unlikely to produce dust. All such materials will be placed directly in the void space behind the working face. Double-handling will therefore not take place thus reducing further the impacts. These operations are unlikely to cause significant airborne dust emissions.

6.2.4 The mineral deposits will be dewatered ahead of extraction, but will remain moist. Significant dust emissions from the extraction processes are unlikely to occur. Moisture levels will increase as the excavations approach the water table which is within 1m of the starting ground level in Phases B and C. Freshly dug mineral is therefore likely to damp and unlikely to give rise to dust although drying of exposed sand surfaces could be rapid in warm dry weather.

- 6.2.5 The inert waste which is to be backfilled will typically comprise excavation and demolition arisings from construction sites. Concrete, bricks and rubble are expected to have been removed at source, in accordance with Environment Agency requirements, and the resulting materials tend to be heavy and cohesive with little tendency to generate dust. The potential for significant dust generation during back-filling operations is therefore low.
- 6.2.6 Loading and tipping, particularly those involving soils and imported back-fill, can lead to dust emissions if care is not taken to minimise drop heights. These may have an occasional impact near the site boundaries.
- 6.2.7 Site haulage is potentially the greatest source of fugitive dust on mineral sites. Due to the size of the site, the haulage distances for mineral and imported back-fill will be considerable and, in the absence of adequate mitigation, could result in the prolonged generation of visible dust. Where this occurs close to site boundaries adverse impacts are likely to occur.
- 6.2.8 Wagons carrying sand and gravel out of the site will be sheeted. In wet conditions vehicles may leave track-out on the access road leading to dust emissions in dry conditions. However, the length of the surfaced access road will reduce the scale of any impact at the site entrance.
- 6.2.9 Stockpiles of mineral will be kept to a minimum and will typically be damp.
- 6.2.10 The amount of stripped ground at any one time will be kept to a minimum and possible impacts will be further reduced by the heavy overburden. However, any disturbance at the surface could result in the release of wind blown dust and which might be carried towards sensitive boundaries. Further wind blown dust could be generated from the surfaces of newly constructed haul roads and soil bunds. As the bunds will generally be located near the site boundaries as amenity or screening bunds, any wind blown dust may be carried towards any property near the boundaries.
- 6.2.11 Saltation, the migration of particles by bouncing across firm surfaces, may occur in windy conditions along the access road. However the downwind side of the access road will be largely screened by the existing hedgerows and a 3m high soil screening bund and any sand blowing from the quarry surfaces is most likely to be trapped by the foliage at ground level within the surrounding vegetation. Impacts due to saltation are therefore unlikely to be significant.
- 6.2.12 In summary, in the absence of mitigation measures, the most significant source of airborne dust is site haulage. Soil and inert waste handling, haulage of incoming back-fill, track-out carried by waste vehicles on to the access road and wind blow across stripped ground and soil bunds provide moderately significant sources of dust.

6.2.13 To assist in preparation of the assessment a site visit was undertaken to Midgeham Quarry, where similar operations to those proposed at Wasing Estate are presently undertaken. At the time of the site visit stockpiled material was being loaded into dump trucks. No visible dust emissions were observed from either the loading or haulage and track-out was not evident on the main highway. Residential properties are located in close proximity to the site. SGP was advised that dust complaints had not been received from these properties.

6.3 Assessment of Impacts

6.3.1 Potentially sensitive properties and landuses that are representative of the local community within 250m of the extraction and access road areas at Wasing Estate are noted in the following table, together with their distance and direction from the nearest source of principal potential quarry sources of emissions to the atmosphere:

Table 6.1: Representative Potentially Sensitive Receptors

Ref	Receptor	Type	Minimum distance and direction to working areas	Nearest potential source	Existing Screening
DR1	Malthouse Cottages	residential	86m N-NW 385m NNW	access road Phase C	partial (low hedgerow)
DR2	allotment gardens	horticultural activities	203m NNW	access road	full (trees & hedgerows)
DR3	White Tower Nursery	nursery	150m N-NW 327m NNW	access road Phase C	partial (hedgerows, trees & Malthouse Cottages)
DR4	Dolphin Close	residential	225m NW	Phase C	partial (hedgerows)
DR5	Aldermaston C of E School	school	214m NW	Phase C	partial (hedgerows)
DR6	Wasing Lodge	residential (isolated)	152m N	Phase C	partial (hedgerows)
DR7	Wasing Lower Farm	farm buildings / commercial	240m NW 230m NE	Phase A Phase C	partial (hedgerows, trees)
DR8	airstrip	leisure	30m W-N 30m E-NE	Phase A Phase C	none / partial none / partial
DR9	Bottle Cottage	residential (isolated property)	130m NW-W	Phase B	partial (hedgerow)
DR10	Sewage Treatment Works	industrial	30m SE	Phase B	partial (woodland)
DR11	Hill Foot Farm	residential	220m S-SW	Phase B	full (dense woodland)

Ref	Receptor	Type	Minimum distance and direction to working areas	Nearest potential source	Existing Screening
DR12	Woolhampton Reed Beds	nature conservation	214m S-SE	Phase B	full (dense woodland)

6.3.2 The identified receptors are shown on Drawing D01. Other potentially sensitive receptors are either more than 250m distant from the site boundaries or are effectively subsumed by the locations identified above. Residential properties within Woolhampton, at Wasing Lower Farm to the south and Shalford Lodge to the southwest all lie beyond 250m of the boundary of the extraction, haul road and access road areas. Other than those on Dolphin Close, all residential properties within Aldermaston lie beyond the 250m boundary.

6.3.3 The boundary of Aldermaston C of E Primary School lies 225m distant from the boundary of the southern edge of Phase C. By reference to Table 3.2, no other high sensitivity receptors have been identified within the 250m boundary. The residential and other receptors are classified as medium sensitivity, with the agricultural land and sewage treatment works adjacent to the site, and the farm buildings at Wasing Lower Farm within 250m of the extraction area boundary, being of low sensitivity.

6.3.4 A public footpath crosses the site and will require temporary diversion around the workings. Parts of public roads (Wasing Lane and Station Road) lie within 250m of the boundary of Phases A, B and C. Both are reasonably well screened by hedgerows along these stretches.

6.3.5 A Site of Special Scientific Interest (SSSI), Woolhampton Reed Beds, is located 214m to the north of the site, beyond the River Kennett and railway line. The site is listed as a consequence due to its' notable nesting birds and diversity of insects. The site is fully screened by extensive woodland present and it is considered that the quarry proposals would have no significant effect in terms of air pollution or dust deposition at the SSSI. There are no other designated wildlife or conservation interests likely to be affected by the proposals with respect to air quality.

6.3.6 In the absence of mitigation measures, the probability of dust being carried towards the key potentially sensitive receptors, and the probability of wind-raised dust being generated, based on the wind data for Heathrow, has been assessed in accordance with Section 3. In practice, the probability of winds carrying dust may be reduced particularly outside the summer months, when rainfall can be typically expected to suppress fugitive dust emissions over more than one third of the time. Assessment results are summarised as follows:

Table 6.2: Summary Estimated Risks (in absence of mitigation)

Receptor	Magnitude of Impacts	Operational Dust		Wind-Raised Dust	
		Probability	Risk	Probability	Risk
DR1	medium	high	moderate	negligible	negligible
DR2	small	low	negligible	negligible	negligible
DR3	medium	high	moderate	negligible	negligible
DR4	medium	low	slight	negligible	negligible
DR5	medium	low	slight	negligible	negligible
DR6	small	high	slight	negligible	negligible
DR7	small	high	slight	negligible	negligible
DR8	large	high	substantial	low	slight
DR9	small	medium	slight	negligible	negligible
DR10	medium	low	slight	negligible	negligible
DR11	imperceptible	high	negligible	low	negligible
DR12	imperceptible	high	negligible	low	negligible

Note: assessment based on distance of receptor to nearest working area of site, including the site access road

6.3.7 A substantial risk of significant nuisance impact is predicted at the air strip, with a slight risk of adverse impacts dust to wind-blown dust. The air strip lies within 30m of the Phase A and C extraction areas within the boundary of Wasing Estate and there is presently limited screening. The proposals include provision of a 3-4m high topsoil screening bund between the airstrip and Phases A and C which will serve to reduce potential impacts on the airstrip.

6.3.8 A moderate risk of significant nuisance impact is predicted at the Malthouse Cottages and White Tower Nursery in the absence of mitigation. Malthouse Cottages, beyond which lie the White Tower Nursery, form the nearest properties to the site access road and could be affected by dust raised by drying track-out on the access road and escaping from haulage of unsheeted incoming loads. Malthouse Cottages lie at the end of the access road which is some 200m long, by which point the potential impact of track-out will be minimal. The majority of back-fill will tend to be more cohesive soils and the prevailing winds will carry the majority of any airborne dust away from the properties. However, haulage will take place over the life of the quarry and care will be required to ensure that even minor impacts do not persist.

6.3.9 A slight risk of significant nuisance impact is predicted at Aldermaston C of E School, Dolphin Close, Wasing Lodge, Wasing Lower Farm and Bootle Cottage, without any use of specific dust control measures. Given the nature of the quarry operations and damp nature of the extracted materials the risk of significant impacts, in the absence of mitigation, is likely to be limited to sustained periods of dry weather. The proposals however include for provision of 3-4m high soil screening bunds around the southern and eastern boundaries of Phase C which will serve to reduce potential impacts on those properties located to the south of the site. The extent of

extraction operations in Phase B towards Bootle Cottage are dependant on the nature of the deposit in this area.

6.3.10 The risk from wind-blown dust affecting the above receptors under strong winds is considered to be negligible in all cases.

6.3.11 On the diverted FP10 footpath, should any of the potential sources give rise to visible dust upwind of the footpath, walkers could be exposed to the effects of dust. However, this will be reduced by the presence of trees and soil bunds providing screening along the eastern edge of Phase A and a soil screening bund along the southern edge of Phase 31b. People boating and walking along the River Kennett are unlikely to be affected by airborne dust at any time on account of the dense woodland between the site and river.

6.3.12 The A340 road passes the entrance to the proposed quarry. However the road is 385m distant from the extraction areas of the site at the closest point and therefore sources of dust are limited to drying track-out on the access road and A340 and escaping from the haulage of unsheeted incoming loads. As noted in para. 6.3.8 the potential for track-out is minimal given the length of the access road. The passage time for motorists will be brief and discernible impacts are unlikely to occur.

6.3.13 A slight risk of adverse nuisance impacts is predicted at the sewage treatment works (STW) to the immediate northwest of Phase B in the absence of mitigation measures. The STW is of low sensitivity.

6.4 Fine Particulates

6.4.1 PM₁₀ will make up a small proportion of any dust emitted, but may travel 1,000m or more. Concentrations will however decrease rapidly on moving away from a source due to dispersion and dilution.

6.4.2 Very little data is presently available on potential PM₁₀ concentrations in the vicinity of sand and gravel quarries. The wet sand and gravel extraction operations themselves are likely to give rise to negligible PM₁₀ concentrations, the greatest potential source of PM₁₀ being haul roads, soil stripping and earthworks. Guidance for air quality review and assessment suggests that sources such as quarries (undefined), stockpiles and landfill sites¹¹ could add up to 5 µg/m³ to annual mean background PM₁₀ concentrations at locations immediately local to the source, and up to 3 µg/m³ within 200 to 400m of the source. Other studies of air quality around large quarries (undefined) have found a more likely range of around 2 µg/m³ increase in PM₁₀ concentrations.

¹¹ DEFRA *Review and assessment technical guidance*, LAQM.TG(02), 2002

6.4.3 Recent guidance on construction dust¹² indicates that the earthworks and haulage of a large construction site (>10 vehicle movements / day; total of >100,000 tonnes of material moved), and to which the site operations can be broadly compared, poses a high risk with regards to PM10 emissions to receptors within 50m, a medium risk to receptors within 200m and low risk to those beyond 200m, in the absence of mitigation.

6.4.4 Section 5.92E of LAQM guidance TG[09] outlines the updating and screening assessment process for fugitive and uncontrolled sources, including quarrying. PM₁₀ is identified as the relevant pollutant and detailed assessment is required where relevant receptors (houses, schools, etc.) are within:

- 1000m where the background PM₁₀ concentration is >28 µg/m³
- 400m where the background PM₁₀ concentration is >26 µg/m³
- 200m for any background
- 50m of off-site roads used to access the site where the background PM₁₀ concentration is > 25 µg/m³

6.4.5 Given that the predicted background PM₁₀ concentrations in the area of the site are <16 µg/m³, a semi-qualitative assessment of PM₁₀ concentrations with the quarry has been undertaken for those receptors within 200m of the site boundaries. There are no receptors within 50m of the site boundaries or access road. A worst case assessment has therefore been undertaken assuming a conservative 3 µg/m³ contribution from the site to the background concentration for those receptors within 200m. The assessment has predicted the magnitude and probability of impact as detailed in Tables 3.6-3.7.

Table 6.3: Assessment of Potential Significance of PM10s from Quarrying (without mitigation)

ref	background concentration (µg/m ³)	potential increase (µg/m ³)	predicted concentration (µg/m ³)	% AQO	change in concentration	significance
worst case	15.6	3.0	18.6	46.5	medium increase	negligible

6.4.6 The worst case assessment predicts a negligible impact at the residential receptors within 200m of the site boundary (Malthouse Cottages, Bottle Cottages, Wasing Lodge and the plant nursery at White Tower Nursery) due to PM₁₀ arising from quarry dust, in the absence of mitigation, and assuming a worst case level of emissions, and no attenuation between the site and receptors. The assessment makes no direct allowance for the reduction in PM₁₀ emissions as a result of the suspension of agricultural activities on the site, and for emissions from traffic on the A340. Taking the above factors into account, there is no likelihood of significant increases in PM₁₀ concentrations for local air quality as a result of the proposals.

¹² Institute of Air Quality Management (IAQM): Guidance on the Assessment of the Impacts of Construction of Air Quality and the Determination of their Significance, December 2011

7 Assessment of Impacts - HGV Exhaust Emissions

7.1 Vehicle Emissions

7.1.1 The principal pollutants of concern with quarry-related HGV exhaust emissions are fine PM₁₀ and NO₂. It is estimated that there will be 120 HGV movements per day at the quarry (40 in / 40 out for mineral extraction; 20 in / 20 out for infill assuming a 50% back-haul). The development is to be served by a single access / egress point from Basingstoke Road. The maximum impacts due to quarry-related traffic may be experienced on the A430 Basingstoke Road to the east of the site and through Aldermaston Wharf. A proportion of the infill delivery (estimated as 40 one-way movements per day) will be via Aldermaston village to the south.

7.1.2 Traffic data for Basingstoke Road close to the proposed access point and the Basingstoke Road / Bath Road junction to the northeast has been provided by David Tucker Associates (DTA). Traffic data is not available for all the roads within Aldermaston, although it is considered Basingstoke Road forms the primary transport route through the village.

7.1.3 The impacts of post-development traffic emissions on existing and proposed receptors in 2011 and 2016 were estimated using the DMRB screening model¹³, with interpolated baseline data from the LAQM website.

7.1.4 The receptors were chosen to provide a worst case assessment and are shown in Drawing D02 and detailed below.

Table 7.1: Details of DMRB Receptors

Receptor Ref	Receptor Type	Details	Road Links
TR1	residential	Malthouse Cottages	Basingstoke Road and site access
TR2	residential	nominal property in Aldermaston Village	Basingstoke Road
TR3	residential	nominal property in Aldermaston Wharf	Basingstoke Road
TR4	residential	nominal property at junction of Basingstoke Road / bath Road	Basingstoke Road and Bath Road

7.1.5 The pollutant concentrations at the receptors in 2011 and 2016, with and without development, were modelled using traffic flow data provided by DTA. The traffic flows on the relevant links utilised in the DMRB modelling are detailed below:

¹³ Design Manual for Roads and Bridges, version 1.03, Highways Agency, 2007

Table 7.2: 2011 Traffic Flows

receptor	link	2011 without development		2011 with development		distance CL (m)	average speed (km/hr)
		AADT	% HGV	AADT	% HGV		
TR1	Basingstoke Road	9228	15.2	9268	15.6	7.5	80
	site access road	0	0	120	100	105	32
TR2	Basingstoke Road	9228	15.2	9268	15.6	4.82	40
TR3	Basingstoke Road	9228	15.2	9268	16.0	5.0	40
TR4	Basingstoke Road	7498	9.43	7639	11.01	29.0	32
	Bath Road East	23770	8.02	23770	8.02	27.0	32

Traffic data calculated from that provided by DTA; average speeds based on speed limits and site observations

Table 7.3: 2016 Traffic Flows

receptor	link	2016 without development		2016 with development		distance CL (m)	average speed (km/hr)
		AADT	% HGV	AADT	% HGV		
TR1	Basingstoke Road	9598	15.2	9638	15.6	7.5	80
	site access road	0	0	120	100	105	32
TR2	Basingstoke Road	9598	15.2	9638	15.6	4.82	40
TR3	Basingstoke Road	9598	15.2	9678	16.3	5.0	40
TR4	Bath Road East	24724	8.02	24724	8.02	29.0	32
	Basingstoke Road	7798	9.43	7939	10.39	27.0	32

7.1.6 The DMRB model estimates oxides of nitrogen (NO_x) levels, which are then converted into NO₂. An updated approach has been adopted for deriving NO₂ from NO_x for road traffic sources¹⁴. In accordance with TG[09] the 'NO_x to NO₂ calculator' provided on the LAQM website¹⁵ has been used to provide a robust assessment of NO₂ concentrations resulting from traffic emissions in the vicinity of the site.

7.1.7 Given the current uncertainty regarding predicted decreases in background NO₂ concentrations¹⁶, to provide a conservative assessment, the building façade concentrations have been calculated using the 2011 background NO₂ data for the grid squares in which the receptors are located (LAQM data) and 2011 traffic emissions data (contained within the DMRB model) for all model runs. PM10 concentrations have been estimated using the predicted LAQM data for the relevant year.

7.1.8 The output spreadsheets are attached as Appendix B and are summarised in the following tables.

¹⁴ Deriving NO₂ from NO_x for Air Quality Assessments of Roads", Air Quality Consultants Ltd, 2006

¹⁵ AEA, NO_x to NO₂ Calculator, Version 2.1, released 22 January 2010, published on DEFRA LAQM website

¹⁶ Prepared for DEFRA, Trends in NO_x and NO₂ emissions and ambient measurements in the UK; 3rd March 2011, AEA, Kings College, London and University of Leeds

Table 7.4: Summary Mean Pollutant Concentrations, 2011

ref	receptor	mean pollutant concentration ($\mu\text{g}/\text{m}^3$)			
		without development		with development	
		NO ₂	PM ₁₀	NO ₂	PM ₁₀
TR1	Malthouse Cottages	19.06	16.86	19.29	16.90
TR2	Aldermaston	20.03	16.31	20.26	16.35
TR3	Aldermaston Wharf	22.08	16.87	22.50	16.93
TR4	Bath Road / Basingstoke Road junc.	23.01	17.43	23.47	17.50

Table 7.5: Summary Mean Pollutant Concentrations, 2016

ref	receptor	mean pollutant concentration ($\mu\text{g}/\text{m}^3$)			
		without development		with development	
		NO ₂	PM ₁₀	NO ₂	PM ₁₀
TR1	Malthouse Cottages	19.39	16.92	19.68	16.96
TR2	Aldermaston	20.41	15.88	20.69	15.92
TR3	Aldermaston Wharf	22.45	16.42	22.92	16.49
TR4	Bath Road / Basingstoke Road junc.	23.29	16.97	23.56	17.02

7.1.9 The modelled increases in post-development NO₂ and PM₁₀ concentrations at the receptors are assessed in accordance with the guidance provided by EPUK¹⁷ and are summarised below.

Table 7.6: Impacts of development in 2011

Receptor	Changes in Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		Magnitude of Change		Significance	
	NO ₂	PM ₁₀	NO ₂	PM ₁₀	NO ₂	PM ₁₀
R1	+0.23	+0.04	imperceptible	imperceptible	negligible	negligible
R2	+0.23	+0.04	imperceptible	imperceptible	negligible	negligible
R3	+0.42	+0.06	small	imperceptible	negligible	negligible
R4	+0.46	+0.07	small	imperceptible	negligible	negligible

Table 7.7: Impacts of development in 2016

Receptor	Changes in Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		Magnitude of Change		Significance	
	NO ₂	PM ₁₀	NO ₂	PM ₁₀	NO ₂	PM ₁₀
R1	+0.29	+0.04	imperceptible	imperceptible	negligible	negligible
R2	+0.28	+0.04	imperceptible	imperceptible	negligible	negligible
R3	+0.47	+0.07	small	imperceptible	negligible	negligible
R4	+0.27	+0.05	imperceptible	imperceptible	negligible	negligible

¹⁷ EPUK: Development Control: Planning for Air Quality. 2010 Update.

7.1.10 The modelled increase in post development NO₂ and PM10 concentrations in 2011 and 2016 at the existing receptors can be described as imperceptible to small, with small increases being predicted at residential properties along Basingstoke Road to the north of the site and at the junction with Bath Road.

7.1.11 The modelled concentrations of NO₂ and PM10 with the development are all 'well below' (<30 µg/m³) the standard of 40 µg/m³ and the significance of the impacts at all the receptors is therefore **negligible**.

7.1.12 The modelled concentration of NO₂ in Aldermaston in 2011 is lower than that measured over the 2009-2010 period at 20 µg/m³ compared to 25 µg/m³. This may be due to the lack of detailed traffic data for the junction at which the diffusion tube is located, and hence underestimation of the concentration by DMRB. However, the incremental increase in NO₂ concentrations due to the HGVs passing this route is estimated as 0.43 µg/m³ (DMRB spreadsheet included in Appendix B) resulting in a small increase (in the range 0.4 – 2 µg/m³) and a **negligible** impact (existing monitored concentration is below the objective).

7.1.13 In summary the modelling predicts negligible impacts on the residential properties located along the HGV transport routes to the north and south of the site due to HGV exhaust emissions.

8 Mitigation

8.1 Dust Control Methods

8.1.1 On account of their low impact, sand and gravel quarries do not fall under Environmental Permitting requirements. However, to minimise any potential impacts, it is recommended that the proposed quarry be operated in accordance with the guidance provided by DEFRA in PG3/8(04), *Secretary of State's Guidance – Quarry Processes*, and the Best Practice Guide appended to the *Environmental Effects of Dust from Surface Mineral Workings*¹⁸. These identify standard good working practices for the minimisation of dust emissions from minerals operations. The essence of the guidance is that dust emissions can be controlled by effective site management.

8.1.2 The principal potential source of airborne dust has been identified as site haulage. Additional impacts may also be caused by soils handling, back-filling with inert waste, haulage of inert waste, track-out carried out by waste vehicles on to the access road and wind blow across the stripped ground.

¹⁸ Best Practice Guide, *Dust and Mineral Operations*, appended to *The Environmental Effects of Dust from Surface Mineral Workings*, DoE, 1995

8.1.3 Particular care will be required to ensure that visible dust emissions, which might be carried towards a sensitive boundary, do not occur. Standard good practices include:

- locating main haul routes towards the centre of the site;
- compaction, grading and maintenance of haul routes;
- setting an appropriate speed limit;
- fitting all vehicles and plant with upswept exhausts and radiator fan shields;
- even loading vehicles to avoid spillages;
- regular removal of spilled material from haul routes; and
- dust suppression by regular spraying in dry conditions.

8.1.4 The potential impacts due to soils handling will be reduced by the minimisation of drop heights. If necessary during adverse winds, operations near sensitive boundaries will be suspended until conditions improve.

8.1.5 The potential impacts due to back-filling will also be reduced by the minimisation of drop heights. Loose dusty rubble will be damped prior to tipping and will be covered immediately by more cohesive materials. Incoming loads will be sheeted to minimise any impacts on the public highway.

8.1.6 Any deposits on the access road will be removed by the regular deployment of a road sweeper. If required during sustained dry periods, or when deemed necessary by the site manager due to excessive dust being generated, the access road will be maintained in a damp condition by bowser.

8.1.7 Wind blow across stripped ground will be controlled by ensuring only the minimum area is open at any one time. The formation of a surface crust will be prompted by the avoidance of its subsequent disturbance. During periods of prolonged dry windy weather, consideration will be given to the application of a soil stabiliser to any areas likely to remain bare temporarily and if likely to generate significant dust.

8.1.8 To minimise wind blow from soils bunds, these will be shaped to give smooth profiles and their surfaces will be consolidated to reduce the availability of fine material. The bunds will be seeded at the earliest possible opportunity to establish rough grass cover.

8.1.9 Other more general matters and the management of the site can affect the likelihood of significant dust emissions. These include:

- use of water for dust suppression, to avoid re-circulating fine materials;
- high standards of house-keeping to minimise track-out and wind blown dust,

- a preventative maintenance programme, including readily available spares, to ensure the efficient operation of plant and equipment, including fixed and mobile dust suppression plant, and
- effective staff training in respect of the causes and prevention of dust.

8.1.10 The measures for dust avoidance, suppression and control will be set down in a dust management scheme for agreement with the MPA. The scheme will accord with DEFRA guidance and Lafarge Aggregates Environmental Management System. The Quarry Manager will refer to the planning conditions and dust management scheme, to determine his response to potential or actual dust emissions, taking into account current and forecast weather conditions and operational plans.

8.1.11 The foregoing standard good working practices and additional mitigation measures are generally accepted by DEFRA and the surface minerals industry as providing effective protection against airborne dust. Their adoption will ensure that operation of the quarry will not cause unacceptable impacts due to airborne dust emissions at any property in the vicinity of the site.

8.1.12 The mitigation of fine particulates emissions will be achieved primarily by means of the standard mitigation measures for general dust outlined above. Guidelines for the anticipatory measures to prevent the onset of dust generation are set out further below, together with a monitoring regime for the site.

8.1.13 No additional measures are required in respect of HGV exhaust emissions.

9 Residual Effects and Conclusions

9.1 The foregoing standard good working practices and additional mitigation measures are generally accepted by the Government and the surface minerals industry as providing effective control against the impact of airborne dust.

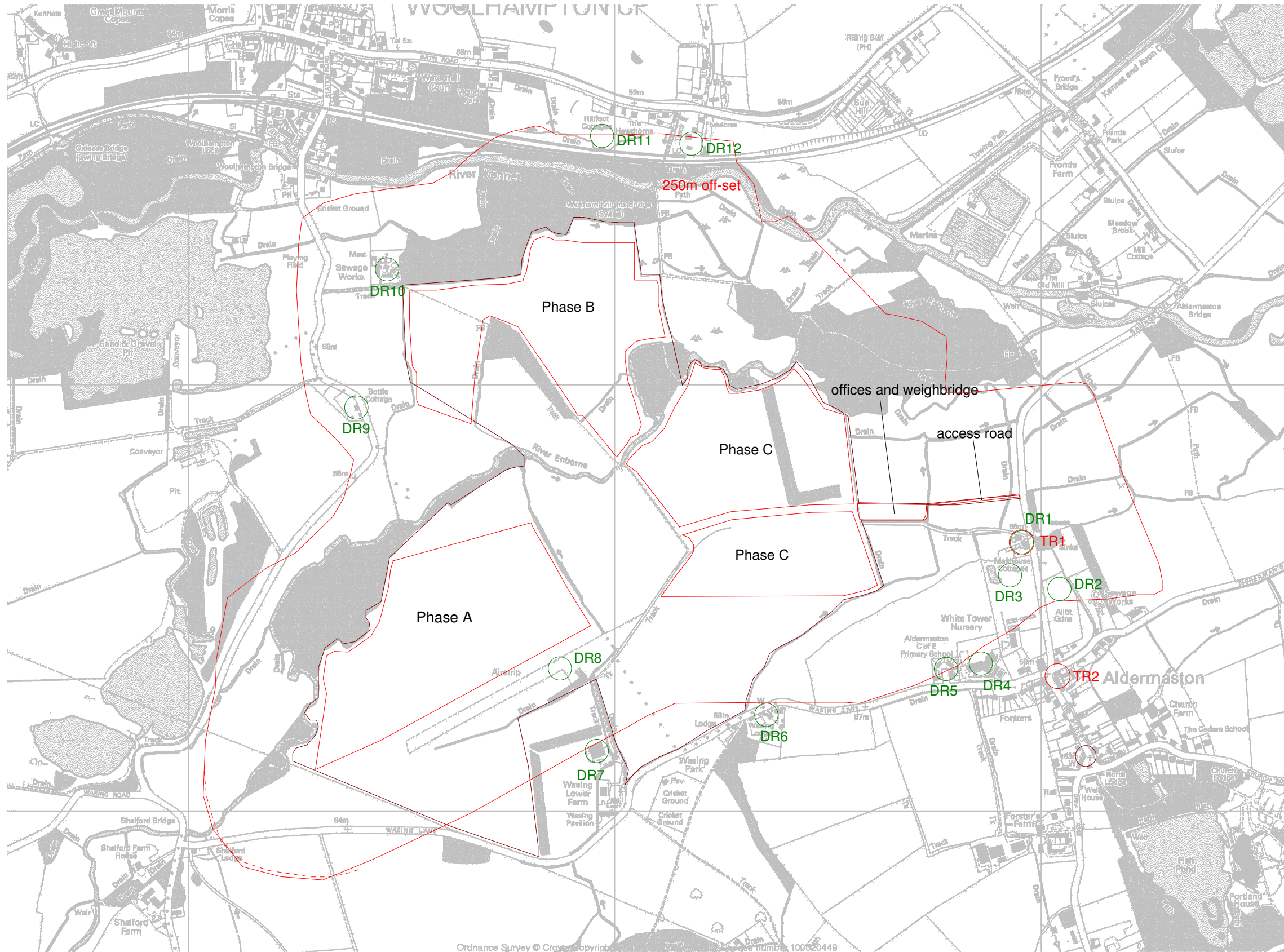
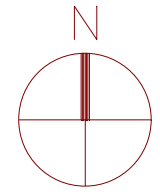
9.2 The proximity of the small airstrip to the extraction areas in the south inevitably means that the airstrip will remain at slight risk of dust deposition in the event of dry conditions and strong winds from the relatively infrequent northerly to easterly directions although the proposed soil bunds will reduce any impacts.

9.3 Overall, with the maintained application of standard good practices, the residual risk of adverse effects outside the site due to dust will be slight or negligible at all receptors. Similar risks are considered to be present in any case as a result of the intensive arable farming taking place in

the area, and potentially dry dusty conditions that are likely to exist in the area during warm dry weather.

- 9.4 Other effects, associated with PM10, Pm2.5 and HGV exhaust emissions have been shown to be either in compliance, or are likely to comply, with the respective AQS objectives.

DRAWINGS



- Wasing Estate boundary
- Operational area boundary
- 250m off-set of operational area boundary (including access road)
- Dust receptors
- DMRB Receptors
- NO2 Diffusion Tube Location

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Smith Grant LLP
 Station House, Station Road
 Ruabon, Wrexham LL14 6DL
 Tel: 01978 822367
 Fax: 01978 8247182
 www.smithgrant.co.uk
 email: consult@smithgrant.co.uk

Project: **Wasing Estate Woolhampton**

Drawing: **Potentially Sensitive Receptors**

Drawn: **KEH** Checked: **AFS**

Date: **19.04.12** Scale: **1:10,000 @ A3**

Job No: **R1619** Drg No: **D01rev2**

Boundaries approximate; based on Illustrative Composite Operations Plan, 0702/W/CO 1, dated 19.01.12 provided by D K Symes Associates

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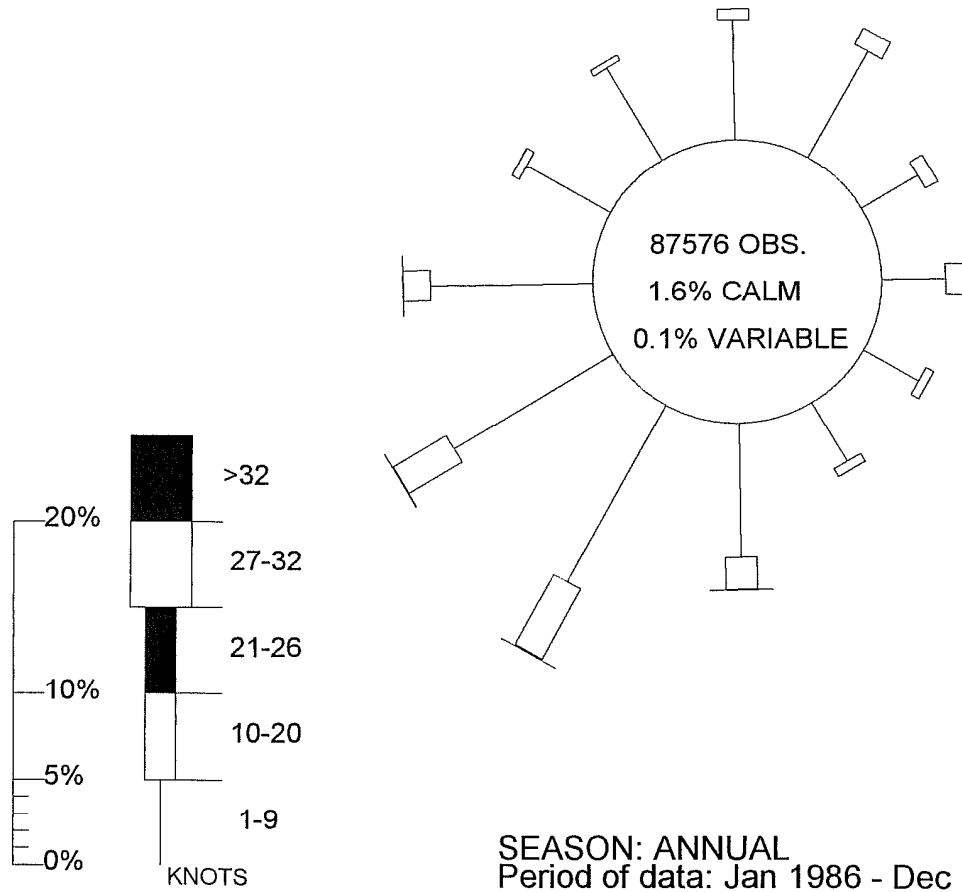
APPENDIX A

WIND ROSES, HEATHROW

WIND ROSE FOR HEATHROW

N.G.R: 5077E 1767N

ALTITUDE: 25 metres a.m.s.l.



SEASON: ANNUAL
Period of data: Jan 1986 - Dec 1995

APPENDIX B

DMRB WORK SHEETS

This spreadsheet calculates the nitrogen dioxide concentration from the modelled oxides of nitrogen concentrations

1). Confirm that the General inputs spreadsheet has been completed

The input selections are shown at the head of the Table below.

2.) Type in (or paste and copy from another spreadsheet)

- 1) the receptor identifier (Receptor ID) and its Easting and Northing. [Optional]
- 2) the modelled contribution from roads to oxides of nitrogen concentrations (Road increment NO_x)
- 3) the local background concentration as NO₂

You may alternatively enter the local background as NO_x for example, if you have modelled a regional background.

Leave the redundant background NO_x or NO₂ columns blank as appropriate

3). The default set-up is to use the fraction of oxides emitted as NO₂ from the General Inputs spreadsheet

Leave the "Fraction emitted as NO₂" column empty to use the default set up.

However, you can overwrite the defaults by typing appropriate values (0-1) into this column.

The fNO2 spreadsheet provides additional values.

4) Click the mouse on the run button to run the model.

The model will calculate:

- a) the total nitrogen dioxide concentration at the receptor (Total NO₂)
- b) the incremental contribution to nitrogen dioxide concentrations from the road vehicle emissions (Road NO₂)

Run NO_x to NO₂

Copy and paste the results to another spreadsheet.

5) Click the mouse on the Clear button to clear the spreadsheet

Clear spreadsheet

Local Authority: West Berkshire			Year: 2011						
Receptor ID	Easting,m	Northing, m	Road increment NO _x µg m ⁻³	Background		Fraction emitted as NO ₂	Total NO ₂ µg m ⁻³	Road NO ₂ µg m ⁻³	Notes
				NO _x	NO ₂				
2011 TR1 wo			19.3		9.3		19.06	9.76	
2011 TR2 wo			21.6		9.17		20.03	10.86	
2011 TR3 wo			21.6		11.34		22.08	10.74	
2011 TR4 wo			23.6		11.34		23.01	11.67	
2011 TR1 w			19.8		9.3		19.29	10	
2011 TR2 w			22.1		9.17		20.26	11.09	
2011 TR3 w			22.5		11.34		22.5	11.16	
2011 TR4 w			24.6		11.34		23.47	12.13	
2016 TR1 wo			20		9.3		19.39	10.09	
2016 TR2 wo			22.4		9.17		20.41	11.24	
2016 TR3 wo			22.4		11.34		22.45	11.11	
2016 TR4 wo			24.2		11.34		23.29	11.95	
2016 TR1 w			20.6		9.3		19.68	10.38	
2016 TR2 w			23		9.17		20.69	11.52	
2016 TR3 w			23.4		11.34		22.92	11.58	
2016 TR4 w			24.8		11.34		23.56	12.22	
2011 TR2 NO2			0.5		1		1.43	0.43	