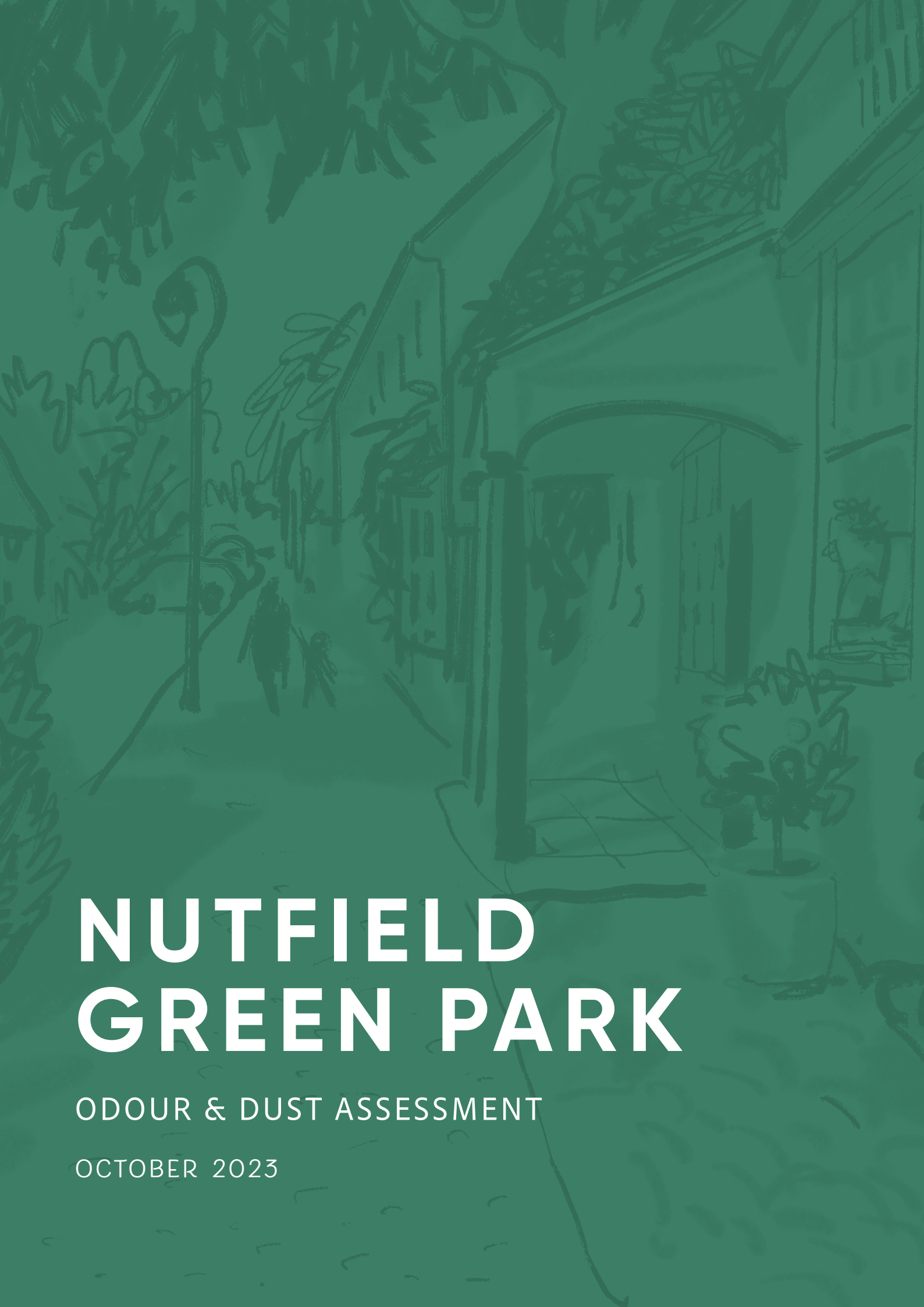

NUTFIELD GREEN PARK

ODOUR & DUST ASSESSMENT

OCTOBER 2023

Odour and Dust Assessment:
Nutfield Green Park

October 2023

Experts in air quality management & assessment

Document Control

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Contents

1 Introduction

1.1 This report describes the potential odour and dust impacts of the existing Redhill Court Landfill and existing Mercers South Quarry on the proposed residential-led development (known as 'Nutfield Green Park') at the Former Laporte Works Site, Nutfield Road, Nutfield, Surrey. The location and setting of the proposed development in relation to the nearby odour and dust sources are shown in Figure 1.

1.2 The proposals for Nutfield Green Park are within approximately 500 m of both sites and therefore have the potential to be affected by existing odour and dust emissions. Redhill Landfill (also known as Patteson Court Landfill) has the potential to generate odorous emissions that could affect the amenity of residents of the proposed development, with dust emissions from Mercers South Quarry and Redhill Landfill potentially impacting the health (through emissions of particulate matter (PM_{10} and $PM_{2.5}$)) and amenity (through total dust emissions) of future residents.

1.3 This report has been prepared taking into account all relevant local and national guidance and regulations.

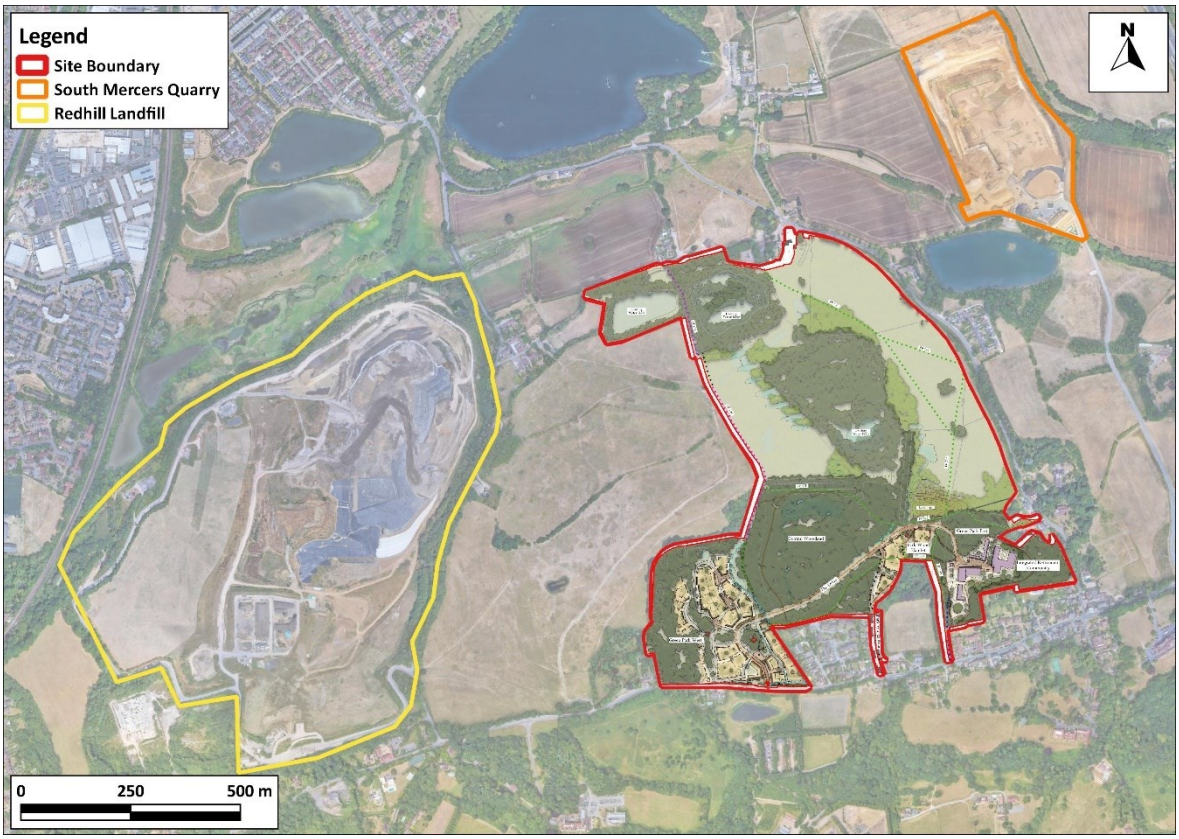

Figure 1: Proposed development Location in Relation to Nearby Dust and Odour Sources

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2 Policy Context

2.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy 2007

2.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Air Quality Strategy 2023

2.3 The Air Quality Strategy: Framework for Local Authority Delivery 2023 (Defra, 2023a) sets out the strategic air quality framework for local authorities and other Air Quality Partners in England. It sets out their powers and responsibilities, and actions the government expects them to take. It does not replace other air quality guidance documents relevant to local authorities.

Clean Air Strategy 2019

2.4 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Environment Act 2021

2.5 The UK's new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.

2.6 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) sets two new targets for future concentrations of $PM_{2.5}$. These targets are described in Paragraph 3.5.

Environmental Improvement Plan 2023

2.7 Defra published its 25 Year Environment Plan in 2018 (Defra, 2018). The Environment Act (2021) requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2023 (Defra, 2023b) is the first revision. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan, including that of achieving clean air.

2.8 The Environmental Improvement Plan 2023 sets out the new air quality targets which have been set for concentrations of $PM_{2.5}$. These targets, which are described in more detail in Paragraph 3.5, include the long-term targets in the Statutory Instrument described in Paragraph 2.6, and interim targets to be achieved by 2028.

2.9 The 2023 Plan outlines the role of local authorities in helping it meet both its targets and existing commitments. It also outlines the respective roles of industry, agricultural sectors, and the Department for Transport in providing the coordinated action required to meet both its new, and pre-existing targets and commitments.

Planning Policy

National Policies

2.10 The National Planning Policy Framework (NPPF) (2023) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.11 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality".

2.12 Paragraph 185 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".

2.13 More specifically on air quality, Paragraph 186 makes clear that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan".

2.14 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".

2.15 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

2.16 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan "*identifies measures that will be introduced in pursuit of the objectives and can have implications for planning*". In addition, the PPG makes clear that *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*.

2.17 Regarding the need for an air quality assessment, the PPG states that:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the

conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity".

2.18 The PPG sets out the information that may be required in an air quality assessment, making clear that:

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".

2.19 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

Regional Policy

2.20 Surrey County Council's Local Waste Plan (Surrey County Council, 2020), which was adopted in December 2020, contains a single policy which refers to dust/odour; policy 14 – Protecting Communities & the Environment. However, this policy only relates to new waste developments, not new developments adjacent to waste sites.

2.21 The same is true for Policy MC14 – Reducing the adverse impacts of mineral development, which is contained within the Surrey Minerals Plan 2011 Core Strategy Development Plan Document (Surrey County Council, 2011).

Local Policies

2.22 The current Tandridge Core Strategy (Tandridge District Council, 2008) contains no policies relating to the loss of amenities within new developments due to odour or dust. However, the Local Plan document "Part 2:Detailed Policies" (Tandridge District Council, 2014) contains one policy relating to dust/odour. DP22: Minimising Contamination, Hazards & Pollution states:

"…….Air Pollution

H. Development will be permitted provided it would not: 1. Have an adverse impact on health, the natural or built environment or amenity of existing or proposed uses by virtue of odour, dust and/or other forms of air pollution; or 2. Be likely to suffer unacceptable nuisance as a result of proximity to existing sources of odour, dust and/or other forms of air pollution."

2.23 At the time of writing, the Inspector examining the draft Tandridge Local Plan 'Our Local Plan: 2033' has issued a letter to the Council dated 10th August 2023, following a procedural meeting held on 27th July 2023. Following a three year protracted examination process, the Inspector has acknowledged a number of procedural challenges in progressing the Plan such that it is not possible to make the Plan sound by proposing main modifications to it and will therefore recommend that the Plan is unsound and that it is not adopted. Alternatively, the Inspector has suggested that the Council may wish to withdraw the Local Plan before his recommendation is confirmed within the Inspector's Examination Report. Until the position on the draft Plan is formalised this Report has included draft Local Plan policies, but in the circumstances, limited weight should now be attributed to them. Once the Local Plan has been found unsound / withdrawn, the draft policies referenced will no longer be relevant and carry no weight in the determination process.

2.24 There is one policy in the above mentioned emerging Tandridge Local Plan (Tandridge District Council, 2019) which refers to dust/odour; TLP46 - Pollution and Air Quality states:

"Pollution

All development proposals must be located and designed to not cause a significant adverse effect upon the environment, the health of residents or residential amenity by reason of pollution to land, air or water, or as a result of any form of disturbance including, but not limited to noise, light, odour, heat, dust, vibrations and littering. New residential development located near to existing uses that generate pollutant, noise, odour or light will be expected to demonstrate that the proposal is compatible, and will not result in unacceptable living standards. Planning conditions may be used to manage and mitigate the effects of pollution and/or disturbance arising from development. Where required, conditions limiting hours of construction, opening hours and placing requirements on applicants to submit further proposal details will be implemented in order to ensure impacts on the environment and residential amenity are kept within acceptable limits and where possible reduced. ……."

3 Assessment Criteria

Health Criteria

3.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

3.2 The UK-wide objectives for PM_{10} were to have been achieved by 2004, and continue to apply in all future years thereafter. Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m^3 (Defra, 2022). The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m^3 it is unlikely that the 24-hour mean objective will be exceeded.

3.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2022). The annual mean objectives are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels.

3.4 For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 3.8), originally set at 25 µg/m^3 and currently set at 20 µg/m^3.

3.5 Defra has also recently set two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of 2040, with the interim target being a value of 12 µg/m^3 by the start of 20281. The second set of targets relate to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be

[1] Meaning that it will be assessed using measurements from 2027. The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of 10.4 µg/m^3 would not exceed the 10 µg/m^3 target.

reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.

3.6 Defra will assess compliance with the population exposure targets by averaging concentrations measured at its own background monitoring stations. This will not consider small changes over time to precisely where people are exposed (such as would relate to exposure introduced by a new development). Furthermore, as explained in Paragraph 2.9, all four new targets provide metrics against which central Government can assess its own progress. While local authorities have an important role delivering the required improvements, the actions required of local authorities relate to controlling emissions and not to directly assessing $PM_{2.5}$ concentrations against the targets.

3.7 Development control decisions can most effectively support Defra to achieve all four targets by optimising new developments to reduce their total emissions. The ambient concentrations to which occupants of new developments are exposed will have no effect on the ability to meet these targets. Similarly, where a new development causes an increase in local concentrations, this must be viewed in the context that all four targets relate to concentrations across England as a whole; there will be very few locations where a localised impact could alter the date by which the target is achieved in England.

3.8 In March 2023, the Department for Levelling Up, Housing and Communities (DLUHC, 2023) explained that the new $PM_{2.5}$ targets will:

"need to be integrated into the planning system, and in setting out planning guidance for local authorities and businesses, we will consider the specific characteristics of $PM_{2.5}$. The guidance will be forthcoming in due course, until then we expect local authorities to continue to assess local air quality impacts in accordance with existing guidance."

3.9 For the time being, therefore, no assessment is required, and indeed no robust assessment is possible, in relation to the new $PM_{2.5}$ targets and they are not considered further.

3.10 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010)[2]. The limit values for nitrogen dioxide, PM_{10} are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the

[2] As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

3.11 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Value
PM_{10}	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year [a]
	Annual Mean	40 µg/m^3
$PM_{2.5}$	Annual Mean	20 µg/m^3 [b]

[a] A proxy value of 32 µg/m^3 as an annual mean is used in this assessment to assess the likelihood of 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2022).

[b] There is no numerical $PM_{2.5}$ objective for local authorities (see Paragraph 3.4). Convention is to assess against the UK limit value which is currently 20 µg/m^3.

Operational Dust Guidance and Criteria

3.12 Dust is categorised into two size classes: 'suspended dust' with diameters below 10 µm (PM_{10}) or below 2.5 µm ($PM_{2.5}$) and 'disamenity' dust with diameters between 10 µm to 75 µm.

3.13 Suspended dusts remain in the air for long periods and are fine enough to be inhaled, potentially causing health effects. Disamenity dusts have a larger particle size, which deposit on surfaces more easily, may be visible to the naked eye, and can cause loss of amenity through soiling and staining, being generally associated with nuisance impacts.

3.14 The assessment criteria for suspended dust are the air quality objectives for PM_{10} and $PM_{2.5}$, which are presented in Table 1. There are currently no statutory standards in the UK covering the release and subsequent impacts of disamenity dust, or levels for dust deposition above which 'nuisance' is deemed to exist. This is due to the inherently subjective nature of nuisance, and is highly dependent upon the existing conditions. Determination of whether or not dust constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the Environment Agency (EA).

3.15 The Institute of Air Quality Management (IAQM)[3] has produced guidance on the Assessment of Mineral Dust Impacts for Planning (IAQM, 2016). Full details of this approach are provided in Appendix A1. This guidance is intended for the use on mineral sites, such as Mercers South Quarry. In the absence of guidance, this guidance has also been used to assess dust emissions from Redhill Landfill.

[3] The IAQM is the professional body for air quality practitioners in the UK.

Odour Guidance and Criteria

3.16 There are currently no statutory standards in the UK covering the release and subsequent impacts of odours. This is due to complexities involved with measuring and assessing odours against compliance criteria, and the inherently subjective nature of odours.

3.17 It is recognised that odours have the potential to pose a nuisance for residents living near to an offensive source of odour. Determination of whether or not an odour constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the EA. The Environmental Protection Act 1990 (1990) outlines that a local authority can require measures to be taken where any:

"dust, steam, smell or other effluvia arising on an industrial, trade and business premises and being prejudicial to health or a nuisance…" or

"fumes or gases are emitted from premises so as to be prejudicial to health or cause a nuisance".

3.18 Odour can also be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act.

Institute of Air Quality Management Guidance

3.19 The latest UK guidance on odour was published by the IAQM in 2018 (IAQM, 2018). The IAQM guidance sets out assessment methods which may be utilised in the assessment of odours for planning applications. It is the only UK odour guidance document which contains a method for estimating the significance of potential odour impacts. Full details of this approach are provided in Appendix A2.

Environment Agency Guidance

3.20 The Environment Agency has also produced a horizontal guidance note (H4) on odour assessment and management (Environment Agency, 2011), which is designed for operators of Environment Agency-regulated processes (i.e., those which classify as Part A(1) processes under the Pollution Prevention and Control (PPC) regime). The H4 guidance document is primarily aimed at methods to control and manage the release of odours, but also contains a series of recommended assessment methods which can be used to assess potential odour impacts.

Screening Criteria

Operational Dust

3.21 The IAQM Guidance on the assessment of Mineral Dust Impacts for Planning (IAQM, 2016) details screening criteria to determine whether dust emissions have the potential for significant air quality impacts. The screening criteria are based on the distance of receptors to dust-generating activities.

3.22 The screening criteria are as follows:

- if there are no relevant receptors within 1 km of the operations, then a detailed dust assessment can be screened out. In such a case, it is considered that, irrespective of the nature, size and operation of the site, the risk of an impact is likely to be “negligible” and any resulting effects are likely to be ‘not significant’;
- in cases whereby receptors are located between 400 m (for hard rock quarries) or 250 m (for sand and gravel quarries) and 1 km of operations, it would normally be assumed that a detailed disamenity dust impact assessment is not required. However, the decision on whether to assess should be made and justified on a site-specific basis; and
- if there are relevant human and/or ecological receptors within 250 m or 400 m (depending on the rock type) then a disamenity dust impact assessment will almost always be required.

3.23 Where the potential dust impact of a mineral site cannot be ‘screened out’, a more detailed dust assessment will be required.

Odour Assessment

3.24 The IAQM Guidance on the assessment of Odour Impacts for Planning (IAQM, 2018) does not specify criteria to screen the risk of odour impacts based on distances to relevant exposure. However, the qualitative risk assessment approach described in the guidance can be used to determine whether there is a risk of odour impacts. The risk assessment utilises the Source-Pathway-Receptor approach, which is based on the assumption that for an impact to occur there needs to be a source of odour, a pathway by which exposure might occur and a receptor that could be adversely affected.

4 Assessment Approach

Study Area

4.1 While the redline boundary covers a large area north of Nutfield, only small areas to the south of the Site will be developed. These include areas for residential use (Use Class C3) and an Integrated Retirement Community (Use Classes C2, E(e), F2); the rest of the site will be subject to ecology enhancement and restoration, with public access to nature and green space. Figure 2 shows the areas proposed for residential and regular recreational use.

4.2 The IAQM minerals guidance (IAQM, 2016) notes that "*adverse dust impacts from sand and gravel sites are uncommon beyond 250 m and beyond 400 m from hard rock quarries measured from the nearest dust generating activities*". Therefore, the focus of the disamenity dust assessment has been on regular use (residential etc.) receptors within 250 m of on-site dust-generating activities (250 m has been used as the site primarily excavates sand). However, the site produces its own recycled aggregate, which will be a mix of rock types of an unknown quantity. Therefore, as a conservative approach, the 400 m screening distance has also been considered. Redhill landfill will be less dusty than a quarry, with soil being the main types of material disturbed; the 250 m is therefore judged to be most appropriate screening distance.

Receptors

4.3 Three areas of proposed sensitive receptors (residential use) have been identified for the dust and odour assessments. As residential use, they are classed as high sensitive receptors to dust and odour, in line with IAQM guidance documents on minerals dust and odours. The locations of the receptors assessed are shown in Figure 2. Furthermore, all footpaths within the green space of the proposed development have been identified as low sensitive receptors to dust and odour. The footpath closest to the landfill has been specifically assessed (Receptor 4 in Figure 2).

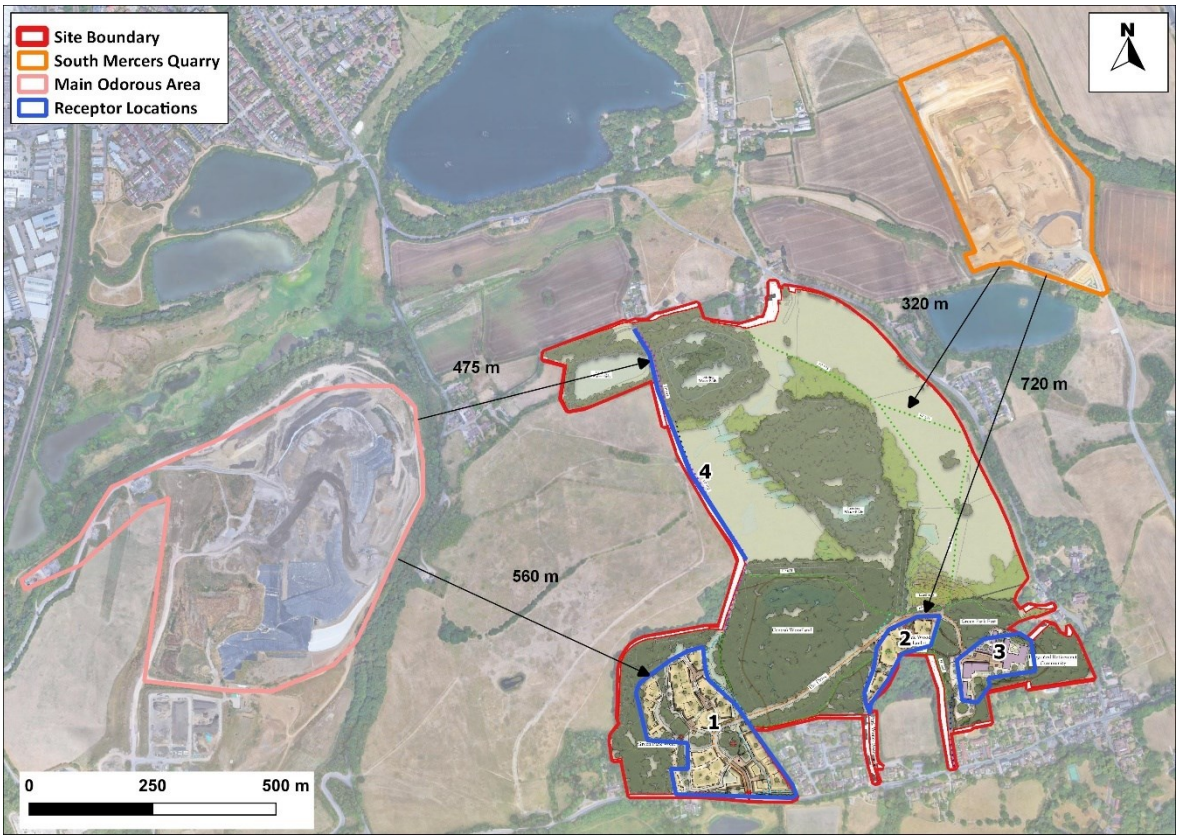

Figure 2: Receptor Locations

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Operational Dust Impacts

4.4 The handling of aggregates has the potential to generate dust emissions. The operational dust assessment considers the potential for impacts within certain distances of the South Mercers Quarry site boundary. The first stage of the assessment is to consider the location of dust generating sources in the site boundary and the distance to nearby receptors (see Paragraph 3.22). If a detailed dust assessment is required (for either suspended (human health) and disamenity dust), the assessment of dust emissions is undertaken in a qualitative manner using a risk-based approach based on a Source-Pathway-Receptor approach. The approach is described in detail in Appendix A1.

4.5 Dust complaints data for the existing operations have also been reviewed within this assessment.

Operational Odour Impacts

4.6 The handling of waste from the nearby Redhill landfill has the potential to generate fugitive releases of odours. The potential for odours from the landfill has been assessed qualitatively, taking into consideration the 'FIDOR' factors for odour exposure, as outlined in the IAQM guidance on assessment of odours for planning (IAQM, 2018). The FIDOR factors are:

- **F**requency – the frequency with which odours are detected;
- **I**ntensity – the intensity of odours detected;
- **D**uration – the duration of exposure to detectable odours;
- **O**ffensiveness – the level of pleasantness or unpleasantness of odours; and
- **R**eceptor – the sensitivity of the location where odours are detected, and/or the proximity of odour releases to an odour-sensitive location.

4.7 The risk of odour impacts has been determined based on the outcome of the qualitative odour assessment, which is based on a Source-Pathway-Receptor approach from the IAQM Guidance on the assessment of Odour Impacts for Planning (IAQM, 2018) (see Appendix A2).

Assessment of Significance

Operational Dust

4.8 In the absence of formal criteria, the significance of the impacts has been judged based on professional experience of the consultants preparing the report, and taking account of the IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning (IAQM, 2016). This includes defining impact descriptors at individual receptors, which take account of the dust generation potential of the sources and the distance and direction of receptors from these sources. Full details of the IAQM approach are provided in Appendix A1. The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A3.

Odour

4.9 There are no formal assessment criteria for quantifying odours. In the absence of formal criteria, the significance of the impacts has been judged based on professional experience and taking account of the IAQM Guidance on the assessment of Odour Impacts for Planning (IAQM, 2018) (see Appendix A2). Again, this includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A3.

5 Baseline Conditions

Relevant Features

5.1 The proposed development is located on the outskirts of the small village of Nutfield and is 2.1 km to the east of Redhill. The application site is surrounded by open grassland and agricultural land to the east, west and north, with Nutfield and the A25 to the south of the site. As seen in Figure 2, at the closest point to the proposed development's sensitive use (residential use etc.), Redhill Landfill is approximately 560 m to the west (of Receptor 1), and South Mercers Quarry is 720 m to the northeast (of Receptor 2). The distances to the proposed development's red line boundary are 320 m and 220 m for the Redhill Landfill and South Mercers Quarry, respectively.

Complaints Analysis

5.2 Odour and dust complaint information relating to the nearby landfill and quarry operations have been obtained during correspondence with Tandridge District Council (TDC), Reigate and Banstead Borough Council (RBBC) and the Environment Agency. TDC have not received any odour or dust complaints relating to either the landfill or quarry in the last five years.

5.3 RBBC direct complainants to the Environment Agency; however, they provided commentary that the landfill had received historical odour complaints in north Redhill. These locations are at least 500 m from the landfill, only slightly closer than the proposed development. This is supported by Environment Agency bulletins[4] and local news articles[5], which state there have been historical issues with the landfill gas capture.

5.4 Complaints data provided by the Environment Agency (EA) shows there have been four complaints regarding Redhill Landfill, the latest being in November 2021. The documentation provided by the EA suggests that more complaints were made to Biffa directly. This would be expected if abnormal odour emissions were released. If the four complaints to the EA are an accurate representation of the number of abnormal odour episodes, they appear to be infrequent. There were no recorded complaints from Nuffield itself. The nearest being unknown locations on the A25 and Cormongers Lane.

5.5 As highlighted in IAQMs odour guidance (IAQM, 2018), lack of complaints does not mean that adverse odour effects will not occur at the proposed development.

[4] https://www.gov.uk/government/publications/redhill-landfill-site-surrey/redhill-landfill-site-surrey

[5] https://www.getsurrey.co.uk/news/surrey-news/whats-smell-redhill-landfill-site-15683626

Industrial Sources

5.6 A search of the UK Pollutant Release and Transfer Register (Defra, 2023c) has not identified any significant industrial or waste management sources that are likely to combine with Redhill Landfill or South Mercers Quarry to impact on the proposed development.

Local Air Quality Monitoring

5.7 Tandridge District Council do not undertake any monitoring of PM_{10} or $PM_{2.5}$. Reigate and Banstead Borough Council undertake PM_{10} and $PM_{2.5}$ at five locations, the nearest being a roadside site, 7 km to the north, adjacent to the A23 (following the M23). Due to the distance away from the proposed development, and its proximity to a major trunk road, it is not judged to be representative of future onsite concentrations.

Air Quality Modelling Concentrations

5.8 As part of the planning submission, AQC has undertaken a site suitability air quality assessment predicting concentrations of nitrogen dioxide, PM_{10} or $PM_{2.5}$. This has included the development of a dispersion model to predict concentrations from road traffic on the nearby A25. These road traffic concentrations have been combined with background concentrations (see Table) to produce a total predicted concentration at the site in the opening year. These are judged to be the best available source of information about future PM_{10} or $PM_{2.5}$ concentrations, and the predicted 2029 concentrations at each receptor are presented in Table 2.

Table 2: Predicted Particulate Matter Concentrations at the development in 2029 (µg/m^3)

Year	PM_{10}	$PM_{2.5}$
Receptor 1	14.2	9.4
Receptor 2	13.6	9.1
Receptor 3	13.6	9.1
Objective	**40**	**20** [a]

[a] The 20 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Background Concentrations

5.9 Estimated background concentrations have been defined using Defra's 2018-based background maps (Defra, 2023d). Concentrations at the proposed development have been presented for 2029, the proposed year of first occupation, and are all well below the objectives.

Table 3: Estimated Annual Mean Background Pollutant Concentrations in 2029 (µg/m^3)

Year	PM_{10}	$PM_{2.5}$
2029	13.45	9.01
Objective	**40**	**20** [a]

[a] The 20 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

6 Impact Assessment

Dust Impact Assessment

Suspended Dust (Human Health)

6.1 IAQM's Mineral Dust guidance (IAQM, 2016) describes that, if there are relevant receptors within 1 km of the operations, and the PM_{10} air quality objectives are not likely to be exceeded, then good practice measures will be sufficient to avoid significant impacts.

6.2 The sensitive use areas (residential etc.) of the proposed development are within 1 km of the existing South Mercers Quarry and Redhill Landfill, see Figure 2; however, as the predicted modelled PM_{10} and $PM_{2.5}$ concentrations at these locations (see Table 2Table 3) are well below their objectives, significant impacts are unlikely. This assumes that best practice measures are being undertaken at the quarry (as part of its environmental permit), of which there is no data (such as ongoing complaints to TDC) to suggest otherwise.

Disamenity Dust

6.3 As detailed within Paragraph 3.2, IAQM guidance states that a disamenity dust assessment would not normally be required in cases where receptors are located less than 400 m (for hard rock quarries) or 250 m (for sand and gravel quarries) from quarry operations. As the sensitive use areas (residential etc.) of the development are approximately 720 m and 560 m from the South Mercers Quarry and Redhill Landfill, respectively, a disamenity dust assessment is not required. Therefore, its effects on amenity of the proposed development are judged to be 'not significant'.

6.4 Furthermore, all public access ways (current and proposed) within the green space area of the proposed development are further than 250 m from the boundaries of South Mercers Quarry and Redhill Landfill (see Figure 2). As 250 m is the most appropriate screening distance (400 m being conservative; see Paragraph 4.2), and considering public access to green space has a lower sensitivity to dust nuisance when compared to residential use, the impacts from dust on the green space within the proposed development is judged to be 'not significant'.

6.5 The above is supported by the absence of complaints reported to TDC from existing users surrounding the South Mercers Quarry operations.

Odour Risk Assessment

Process Description

6.6 The Redhill Landfill is operated by Biffa Waste Services and holds a permit (EPR/BU8126IY[6]) under the Environmental Permitting (England and Wales) Regulations 2016, as amended ('EPR'). The landfill is split into two areas, SWA and NEQ, previously under separate permits but now consolidated. Both sections have permission to dispose of non-hazardous waste within a landfill, with the current waste acceptance limit at 750,000 tonnes a year of non-hazardous waste (mainly municipal). An additional 750,000 tonnes of waste can be accepted, including inert waste, waste for restoration and hazardous waste. These waste types are judged to be less odorous than non-hazardous waste.

6.7 The landfill is understood to have permission to dispose of waste until 2027, with the landfill being fully restored, with capping and gas infrastructure, by 2030[7]. However, this is not included in the site environmental permit (EPR/BU8126IY), and there is no guarantee further waste acceptance will not be permitted beyond this date.

6.8 Based on the permit, the SWA area of the landfill has been filled and permanently capped; and is only accepting inert waste for the final stages of permanent capping, landscaping and waste recycling activities. All potential odorous activities, such as leachate handling and landfill gas management, which support the SWA area, are occurring within the NEQ area of the landfill. While permanent capped landfills have the potential to reduce odour, a permanent capped landfill that complies with best practice landfill gas management (as required within their permit) should not be significantly odorous. Therefore, the odour assessment of the landfill will concentrate on the NEQ area of the landfill, where active deposition occurs, the gas collection compound and the leachate handling, as seen in Figure 2.

Source Odour Potential

6.9 The first step of the odour risk assessment is to identify the source odour potential or odour magnitude. This takes into account the scale and nature of the odorous processes; the continuity, intensity and offensiveness of odour releases; and any odour control measures that are used. In essence, it must consider the odour potential of the source with respect to the FIDO part of FIDOR.

6.10 The handling and disposal (through landfill) of large quantities of waste and the subsequent production of landfill gas has the potential to generate highly offensive odours. As the type of waste

[6] The latest variation of the permit can be accessed online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/865927/Variation_Notice.pdf

[7] https://www.lambeth.gov.uk/sites/default/files/pl_Lambeth_Surrey_waste_SCG_0.pdf

handled will contain large quantities of biological waste, which will decompose, the release of strong odours cannot be ruled out. Activities that will be particularly odorous will be the tipping of waste within the landfill and the biological breakdown of waste to produce landfill gas in areas where the capping and landfill gas collection systems are not fully installed.

6.11 Based on the above, the overall source odour potential of the Redhill Landfill is judged to be Large.

Pathway Effectiveness

6.12 In order to consider the effectiveness of the pathway, it is important to consider receptor locations in terms of their proximity to the odour source and the prevailing wind direction. Three receptor locations have been selected for this assessment. These represent the sensitive use areas (residential etc.) within the proposed development. These receptor locations are shown in Figure 2.

6.13 The wind rose from Kenly Airfield meteorological station, presented in Figure 3, demonstrates that the prevailing wind is from the southwest. In general, odours will be transported by the wind and will not be detectable at locations upwind of a source. The exception to this is during very light wind conditions when odours may disperse against the wind direction, although typically only for relatively short distances.

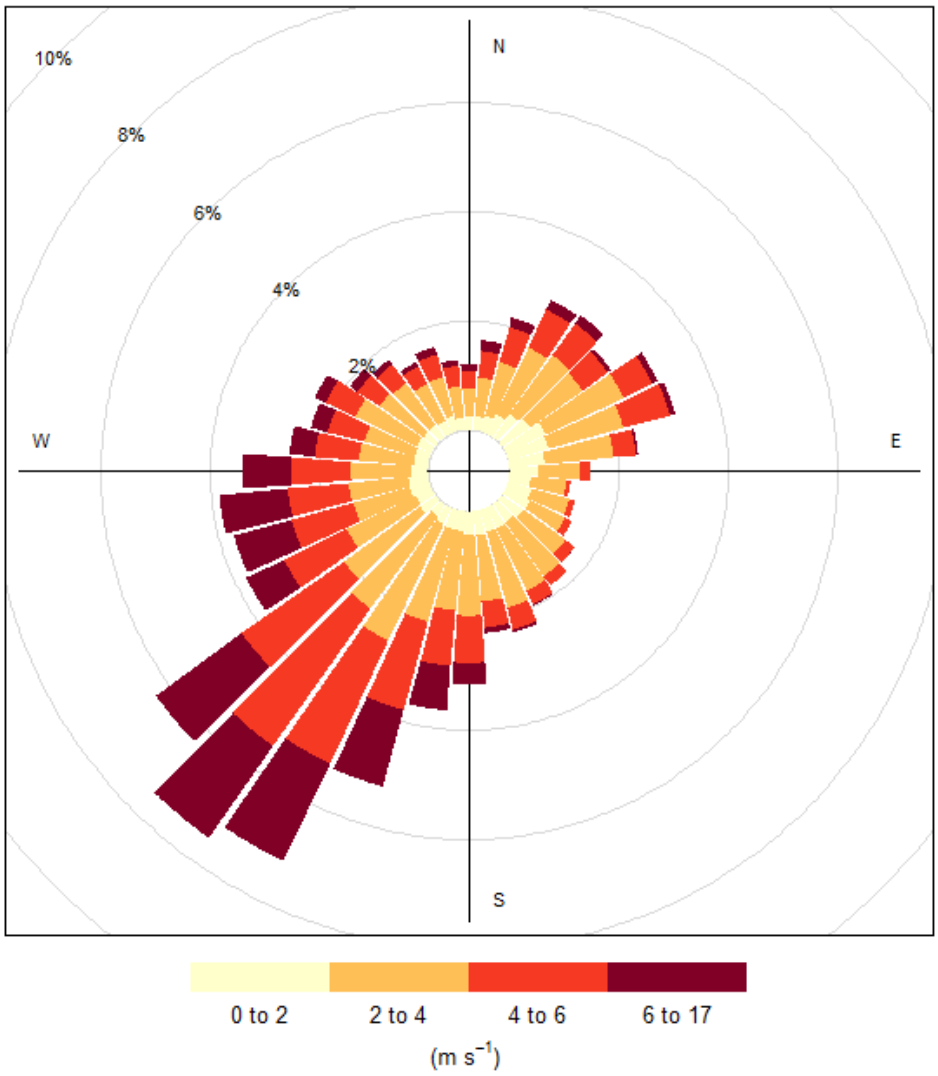

Figure 3: Kenly Airfield Windrose (2018 – 2022)

6.14 The effectiveness of the odour pathway between the existing landfill and the proposed development is summarised in Table 4, which draws upon the guidance set out in Appendix A2.

Table 4: Effectiveness of Odour Pathway

Receptor		Distance from Source [a]	Direction from Source (°)	% Winds from Source	Pathway Effectiveness [b]
ID	Location				
1	Residential	570 m	265 -327	14.3	Moderately Effective
2	Residential	970 m	265 -306	10.6	Ineffective
3	Residential	1,130 m	265 -301	10.6	Ineffective
4	Green Space (Nearest Footpath)	477 m	225 - 335	33.4	Moderately Effective

[a] Measured as the distance from the boundary of the landfill. In the case of the green space, this the closest footpath (Receptor 4) to the landfill.

[b] Overall pathway effectiveness is based on professional judgement, taking account of distance between source and receptor, and frequency of winds with respect to the average.

6.15 All residential receptors are situated over 500 m from the odour source but are downwind of the proposed operations reasonably frequently (due to the potentially large spatial extent of the odour source). Where receptors are less than 1 km from the landfill, the pathway to these receptors is judged to be Moderately Effective; at distances greater than, or approaching, 1 km, the pathway is judged to be Ineffective. The closest footpath within the Green Space is just less than 500 m from the landfill, and considering the majority of paths are greater than 500 m away, the pathway effectiveness to the green space is judged to be Moderately Effective.

Receptor Sensitivity

6.16 The sensitivity of each of the receptors is set out in Table 5. Receptor sensitivities are based on the descriptors presented in Table A2.1.

Potential Odour Effects

6.17 The assessment of the potential odour effects at sensitive receptor locations are presented in Table 5. This brings together the source odour potential, the effectiveness of pathway and the receptor sensitivity, to identify an overall potential for odour effects, using the matrices set out in Table A2.2 and Table A2.3.

Table 5: Assessment of Potential Odour Effects from the Redhill Landfill

Receptor	Risk of Odour Impact (Dose)			Receptor Sensitivity	Likely Odour Effect
	Source Odour Potential	Effectiveness of Pathway	Risk of Odour Impact		
1	Large	Moderately Effective	Medium Risk	High	Moderate Adverse Effect
2	Large	Ineffective	Low Risk	High	Slight Adverse Effect
3	Large	Ineffective	Low Risk	High	Slight Adverse Effect
4	Large	Moderately Effective	Medium Risk	Low [a]	Negligible Effect

[a] The Green Space is proposed as an open space with accessible footpaths. As the proposed use will be transient, it is judged that users would not expect the same amenity levels as for a recreational use area (such as an arboretum or sports pitches). As such, the receptor sensitivity is judged to be Low.

6.18 The potential odour effects have been identified using the effect ≈ dose x response relationship identified in Paragraph A2.2. The process is described as follows:

1) Identify the impact:

6.19 Based on a Large source odour potential, where the pathway is deemed to be Moderately Effective, the risk of odour impacts (dose) is judged to be Medium (see Table 5). For the same Large source, where the pathway is deemed to be Ineffective, the risk of odour impacts is judged to be Low.

2) Consider the response:

6.20 Based on the matrix presented in Table A2.3, for High sensitive receptors, a Medium risk of odour impacts will lead to a Moderate Adverse Effect, and a Low risk of odour impacts leads to a Slight Adverse Effect. For Low sensitive receptors, a Medium risk of odour impacts will lead to a Negligible Effect.

6.21 The potential odour effects at each receptor location are summarised in the final column of Table 5. The final stage of the risk assessment is to make an overall judgement as to the likely significance of effects. In this case, significance has been judged by combining the results of the odour risk assessment and complaints analysis.

Overall Significance of Odour Effects

6.22 The odour risk assessment, which takes account of proximity of the proposed receptors and also the frequency of the proposed development being downwind of the landfill, has demonstrated that there is the potential for Moderate Adverse odour effects across the most western portion of the proposed development (Receptor 1).

6.23 The information on complaints is not detailed enough to rule out adverse impacts. However, based on information provided by the Environment Agency, there have been no complaints from Nutfield itself (near the proposed development) and odour episodes large enough to generate complaints in Redhill (the same distance from the landfill as the proposed development, although in a different wind direction) are infrequent. Without supporting evidence from onsite field assessments (sniff testing) to understand the real-world exposure, significant effects at Receptor 1 cannot be ruled out in the landfills current state, but the risk of adverse effects is judged to be low.

6.24 The landfill site is believed to cease to accept waste as early as 2027, with it being fully restored by 2030. As a fully and appropriately capped landfill will significantly reduce the risk of odour emissions, prolonged adverse odour effects are unlikely once the landfill activities are completed. However, as there is potential for the lifetime of the landfill to be extended, onsite field surveys are recommended to demonstrate 'not significant' effects in the landfill's current state.

4.25 The odour risk assessment has demonstrated the potential for Slight Adverse Effects at Receptors 2 and 3 and Negligible Effects at Receptor 4. As IAQM guidance (IAQM, 2018) concludes that any effects that are Slight Adverse or less can be considered not significant, the odour effects from the landfill on Receptors 2, 3 and 4 are **not significant**. This is supported by a lack of complaints data from TDC, as Receptors 2 and 3 are at the same distance from the landfill as the village of Nutfield.

7 Mitigation

7.1 The odour assessment has identified potentially significant odour impacts at Receptor 1 within the western parcel of the proposed development. Mitigation of odour impacts from an existing source is not straightforward. At-source odour mitigation relies on the willingness of the operator of the existing facility generating the odours and are unlikely to be achieved. Furthermore, onsite mitigation is difficult, especially if outdoor garden spaces are provided.

7.2 Barriers to the transport of air that will block the pathway, creating more turbulent wind flow and thus greater mixing and dispersion, may have an effect, but this is not easily demonstrable. As such, the bank of tall, dense trees between the landfill site and the new homes within the proposed development are likely be beneficial in terms of reducing the impact of odours from the landfill. Although it is not possible to demonstrate this to be adequate mitigation to prevent adverse odour effects but may help reduce the odour exposure in worst-case conditions and therefore provide some protection for future residents.

7.3 It is recommended that further odour assessment work (using sniff testing) is undertaken as a pre-commencement planning condition, to help inform the design and layout of development within the Receptor 1 area. This will help determine if there is no need for any mitigation, or whether the design can be developed to avoid any buildings being constructed where adverse odour effects may occur. It may also be possible to phase development to ensure that occupation of dwellings in the Receptor 1 area occurs at a time in which the landfill site ceases to accept new waste and has been capped. The landfill site is believed to cease to accept waste as early as 2027, with it being fully restored by 2030. The lifetime of the landfill may be subject to a future application for extension.

8 Conclusions

8.1 The assessment has considered the odour and dust effects of the existing Redhill Landfill and South Mercers Quarry on the proposed development.

Operational Impacts

Impacts

8.2 Assessments of both suspended (human health) and disamenity dust risk from the operations of South Mercers Quarry have been undertaken based on IAQM Minerals Guidance (IAQM, 2016). It is concluded that there is no risk of the current operations causing exceedances of the PM_{10} or $PM_{2.5}$ objectives at the proposed development. Furthermore, the disamenity dust risk assessment has concluded 'not significant' effects.

8.3 The odour risk assessment has identified Moderate Adverse potentially significant effects within the western parcel of the proposed development. However, is it understood that the landfill will stop waste acceptance and be fully capped by 2030, with the earliest year of first occupation of the development being 2029[8]. As a fully and appropriately capped landfill significantly reduces the risk of odour emissions, prolonged adverse odour effects are unlikely at the development if the landfill closes as anticipated. However, as there is potential for the lifetime of the landfill to be extended, onsite field surveys are recommended to demonstrate 'not significant' effects if the landfill was to continue operating beyond 2030.

8.4 The odour risk assessment and lack of odour complaints reported to TDC supports the conclusion of 'not significant' effects at the central and eastern parcels of the proposed development.

Mitigation

8.5 Mitigation of odour impacts from an existing source is not straightforward. Planning occupation of the development in the southwest area of the site until the landfill ceases operation and is fully capped is the most effective mitigation option to eliminate any risk of odour effects. However, further assessment work to be secured as a planning condition may demonstrate this area of land being suitable for development, or inform design in relation to avoiding any adverse odour impacts.

[8] The specific first year of occupation of the proposed development will be determined by future planning conditions; at present, this is an outline application. Therefore, the assumption that the proposed development is complete and operational in 2029 suggests the site may be open before the landfill is closed, which may not be the case.

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10 Glossary

AQC	Air Quality Consultants
AQMA	Air Quality Management Area
Defra	Department for Environment, Food and Rural Affairs
EPUK	Environmental Protection UK
EU	European Union
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
LAQM	Local Air Quality Management
µg/m^3	Microgrammes per cubic metre
NPPF	National Planning Policy Framework
OEP	Office for Environmental Protection
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
WHO	World Health Organisation

11 Appendices

A1 Mineral Dust Assessment Procedure

A1.1 The guidance developed by the IAQM on the Assessment of Mineral Dust Impacts for Planning (IAQM, 2016), provides criteria to screen the need for a detailed assessed, and, if required, a suggested approach to the detailed assessment of mineral developments.

Screening Assessment

A1.2 The guidance sets out screening criteria that can be used to determine whether a detailed air quality assessment is required.

A1.3 If there are no relevant receptors within 1 km of the operations, then a detailed dust assessment can be screened out. In such a case, it is considered that irrespective of the nature, size and operation of the site, the risk of an impact is likely to be “negligible” and any resulting effects are likely to be ‘not significant’.

A1.4 In cases whereby receptors are located between 400 m, or 250 m (depending on the rock type) and 1 km of operations, it would normally be assumed that a detailed disamenity dust impact assessment is not required. However, the decision on whether to assess should be made and justified on a site-specific basis by a suitably experienced air quality professional taking into account local factors.

A1.5 If there are relevant human and / or ecological receptors within 250 m or 400 m (depending on the rock type) then a disamenity dust impact assessment will almost always be required. This step is deliberately chosen to be conservative (and will in practice result in assessments being required for most minerals development schemes).

Detailed Assessment

A1.6 If a detailed assessment is required the guidance describes the assessment approach in three steps, which are described in detail in the sections below.

Table A1.1: Detailed Assessment Steps

Step	Action	Consideration
Step 1	Describe Site Characteristics and Baseline Conditions	Such as extent of site boundary, operations, mineral type, production rate, working method, scale and duration of works, consideration of existing baseline conditions and dust sources
Step 2	Estimate Dust Risk	Consideration of pathway effectiveness and residual source emissions
Step 3	Estimate Likely Magnitude of Effect	Consideration of dust impact risk and receptor sensitivity

Step 2

Determination of Residual Source Emissions

A1.7 The residual source emission is determined considering site characteristics and the potential for emissions from each source, taking into account designed-in mitigation measures.

A1.8 As stated within the guidance the following factors should be considered:

- the activities being undertaken (blasting, crushing, screening, methods of handling and storage etc.);
- the types and properties of the materials involved;
- the size of the site and, specifically, the area of land being worked (and hence the quantities of materials involved and the number of vehicles and plant etc.);
- the durations and frequencies of the activities;
- the likely effectiveness of the dust control measures incorporated into the design of the submitted development scheme, including design features, management controls (ideally formalised within a Dust Management Plan) and, where appropriate, engineering controls;
- other mitigation measures applied to reduce or eliminate dust; and
- the meteorological conditions that can promote or inhibit the raising of dust at the source (high winds and rainfall, respectively).

A1.9 The guidance provides examples illustrating factors that need to be considered when making a professional judgement as to the residual source emissions.

Table A1.2: Factors to Consider When Determining Residual Source Emissions

Source Activity	Factor for Consideration
Site Preparation/Restoration	Size of working area
	Height of bunds
	Volume of Material movement
	No. of heavy plant
	Whether bunds are seeded or sealed
	Potential of material for dust generation
Mineral Extraction	Size of working area
	Extraction method (low or high energy)
	Potential of material for dust generation
Materials Handling	No. of heavy plant
	Type of surface (paved or unconsolidated)

Source Activity	Factor for Consideration
	Distance of activities to site boundary (or in void)
	Potential of material for dust generation
On-site Transportation	Transport method (un-consolidated haul road or use of conveyors)
	Type of haul road (unpaved or paved)
	Dust potential of road surface
	No. of heavy vehicle movements
	Length of haul roads
	Vehicle speed (controlled or uncontrolled)
Mineral Processing	Potential of raw material for dust generation
	Potential of end product for dust generation
	Complexity of process
	Volume of material processed
Stockpiles/exposed surfaces	Length of stockpile storage
	Frequency of material transfer
	Potential of raw material for dust generation
	Type of surface (paved or unconsolidated)
	Distance of stockpiles to site boundary (or in void)
	Area of exposed surfaces
	Wind speed and dust threshold
Off-site Transportation	No. of HGV movements
	Type of Access Road (unpaved or paved)
	Vehicle cleaning facility provision
	Length of access road

Estimation of Pathway Effectiveness

A1.10 The effectiveness of pathway is determined based on site-specific factors considering the distance and direction of each receptor relative to the prevailing wind direction. The frequencies of wind in each direction are calculated based on meteorological data for five years from a nearby meteorological station. The frequency of exposure of receptors to moderate to high winds from the direction of the source is categorised as detailed in Table A1.3 and the distance of the receptor to source as detailed within Table A1.4. Consideration of topography and physical features is also required.

Table A1.3: Categorisation of Frequency of Potentially Dusty Winds

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

Table A1.4: Categorisation of Receptor Distance from Source

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

A1.11 The resulting pathway effectiveness for each receptor is identified using the criteria in Table A1.3 and Table A1.4 as shown in Table A1.5.

Table A1.5: Pathway Effectiveness

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

A1.12 The risk ratings for residual source emissions and pathway effectiveness (for each receptor) identified using the criteria in Table A1.2 and Table A1.5 are then combined using the matrix shown in Table A1.6 to estimate an overall risk of dust impact at each specific receptor location.

Table A1.6: Estimation of Dust Impact Risk

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

Step 3

A1.13 The next stage of the risk assessment is to identify the potential dust effect at each receptor location. This is done using the matrix presented in Table A1.7, which combines the overall dust impact risk descriptor for each receptor with the receptor sensitivity.

Table A1.7: Assessment of Dust Magnitude of effects

		Receptor Sensitivity		
		Low	**Medium**	**High**
Dust Impact Risk	**High Risk**	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
	Medium Risk	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
	Low Risk	Negligible Effect	Negligible Effect	Slight Adverse Effect
	Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

A1.14 As a final stage of assessment, an overall significance of dust effects is determined, based on professional judgment and taking into account the significance of effect at each specific receptor location for each activity.

A2 Odour Risk Assessment Procedure

A2.1 The odour risk assessment set out in the IAQM guidance follows a Source-Pathway-Receptor approach. This approach describes the concept that, in order for an odour impact (such as annoyance or nuisance) to occur, there must be a source of odour, a pathway to transport the odour to an off-site location, and a receptor (e.g. people) to be affected by the odour.

A2.2 The risk of odour effects at a given receptor location may be estimated using the following fundamental relationship:

Effect ≈ Dose x Response

A2.3 In this relationship, the dose is a measure of the likely exposure to odours, in other words the impact. The response is determined by the sensitivity of the receiving environment and thus the overall effect is the result of changes in odour exposure at specific receptors, taking into account their sensitivity to odours.

A2.4 In order to determine the risk of potential odour effects from the TWTS, the 'FIDOR' factors for odour exposure have been used. These factors are commonly used in the assessment of odours and are outlined in the IAQM guidance, but are also described in the Environment Agency's H4 guidance document on odour management (Environment Agency, 2011). The FIDOR factors are:

- **F**requency – the frequency with which odours are detected;
- **I**ntensity – the intensity of odours detected;
- **D**uration – the duration of exposure to detectable odours;
- **O**ffensiveness – the level of pleasantness or unpleasantness of odours; and
- **R**eceptor – the sensitivity of the location where odours are detected, and/or the proximity of odour releases to an odour-sensitive location.

A2.5 Odour emissions from the landfill extension have been assigned a risk-ranking based on the "effect ≈ dose x response" relationship, whereby the dose (impact) is determined by the "FIDO" part of FIDOR, and the response is determined by the "R" (receptor sensitivity). The risk of odour effects can therefore be described as:

Effect ≈ Impact (FIDO) x Receptor Sensitivity (R)

A2.6 The key factors that will influence the effects of odours are the magnitude of the odour source(s), the effectiveness of the pathway for transporting odours, and the sensitivity of the receptor. The methodology set out in the IAQM guidance document describes in detail a Source-Pathway-Receptor approach to odour risk assessment, and includes tables and matrices to assist in

determining the likely risk of odour effects. The IAQM methodology is outlined below. It includes an element of professional judgement.

A2.7 The assessment examines the source odour potential (source magnitude) of the landfill extension, and then identifies the effectiveness of the pathway and receptor sensitivity at sensitive locations.

A2.8 Table A2.1 describes the risk-rating criteria (high, medium and low) for source odour potential, pathway effectiveness and receptor sensitivity applied in this assessment. This table has been adapted from Table 8 in the IAQM odour guidance.

Table A2.1: Sensitivity of the Area to Dust Soiling Effects on People and Property

Source Odour Potential	Pathway Effectiveness	Receptor Sensitivity
Large Source Odour Potential: Large-scale odour source and/or a source with highly unpleasant odours (hedonic tone -2 to -4); no odour control.	**Highly Effective Pathway:** Very short distance between source and receptor; receptor downwind of source relative to prevailing wind; ground level releases; no obstacle between source and receptor.	**High Sensitivity:** Highly sensitive receptors e.g. residential properties and schools.
Medium Source Odour Potential: Medium-scale odour source and/or a source with moderately unpleasant odours (hedonic tone 0 to -2); basic odour controls.	**Moderately Effective Pathway:** Receptor is local to the source; releases are elevated, but compromised by building effects.	**Medium Sensitivity:** Moderately sensitive receptors e.g. commercial and retail premises, and recreation areas.
Small Source Odour Potential: Small-scale odour source and/or a source with pleasant odours (hedonic tone +4 – 0); best practise odour controls.	**Ineffective Pathway:** Long distance between source and receptor (>1 km); receptors upwind of source relative to prevailing wind; odour release from stack/high level.	**Low Sensitivity:** Receptors not sensitive e.g. industrial activities or farms.

A2.9 The risk ratings for source magnitude and pathway effectiveness (for each receptor) identified using the criteria in Table A2.1 are then combined using the matrix shown in Table A2.2 to estimate an overall risk of odour impact at each specific receptor location.

Table A2.2: Assessment of Risk of Odour Impact at a Specific Receptor Location

Pathway Effectiveness	Source Odour Potential (Source Magnitude)		
	Large	Medium	Small
Highly Effective	High Risk	Medium Risk	Low Risk
Moderately Effective	Medium Risk	Low Risk	Negligible Risk
Ineffective	Low Risk	Negligible Risk	Negligible Risk

A2.10 The next stage of the risk assessment is to identify the potential odour effect at each receptor location. This is done using the matrix presented in Table A2.3, which combines the overall odour impact risk descriptor for each receptor with the receptor sensitivity determined using the criteria in Table A2.1.

Table A2.3: Assessment of Potential Odour Effect at a Specific Receptor Location

Risk of Odour Impact	Receptor Sensitivity		
	High	Medium	Low
High Risk	Substantial Adverse Effect	Moderate Adverse Effect	Slight Adverse Effect
Medium Risk	Moderate Adverse Effect	Slight Adverse Effect	Negligible Effect
Low Risk	Slight Adverse Effect	Negligible Effect	Negligible Effect
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

A2.11 As a final stage of assessment, an overall significance of odour effects is determined, based on professional judgment and taking into account the significance of the effect at each specific receptor location.

A3 Professional Experience

Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is a Technical Director with AQC, with 17 years' experience in the field of air quality and odour consultancy with extensive experience in the monitoring and assessment of odours for a wide range of odour sources. He has produced odour assessments for a range of purposes including planning and environmental permitting within the UK for new odorous processes such as poultry farms, waste management facilities, industry and commercial kitchens. He also has extensive experience in relation to odour assessments for residential and commercial developments that encroach on existing odour sources, such as wastewater treatment works, intensive livestock facilities, and landfill sites. Mr Caird has experience in a range of odour monitoring and assessment methods including odour risk assessments, odour dispersion modelling, field odour surveys (known as sniff testing), community odour surveys and odour sampling and analysis. He is a contributory author of the Institute of Air Quality Management's Guidance on the assessment of odours for planning (2018) and provided input to the EMAQ+ Guidance on control of odour and noise from commercial kitchen exhaust systems in the UK. Laurence has also acted as expert witness on odours at Planning Inquiries relating to anaerobic digestion, intensive poultry farming and waste management facilities such as energy from waste sites. He is a Member of the Institute of Air Quality Management (and a former IAQM Committee Member) and is a Chartered Scientist.

Adam Dawson, BSc (Hons) MSc MIEnvSc MIAQM

Mr Dawson is a Principal Consultant with AQC with over nine years' experience in the field of air quality assessment. He undertakes air quality and odour assessments for AQC, covering residential and commercial developments, industrial installations, energy centres and waste facilities. He has experience using a range of dispersion models including ADMS-Roads, ADMS-5 and Breeze AERMOD to complete quantitative modelling assessments, for both planning and permitting purposes. He previously spent over two years as part of the Environment Agency's permitting team, so has extensive experience of the permitting process and industrial emissions. He is a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.