

4. INTRODUCTION

- 4.1 This Chapter assesses the potential environmental impacts of emissions to air associated with the proposed development. A detailed Air Quality Impact Assessment (AQIA) forms a Technical Appendix to this Air Quality Chapter of the Environmental Statement (ES) and is referenced throughout the chapter.

Proposed Development

- 4.2 Full details of the proposed development are provided in Chapter 3.
- 4.3 The Site will process approximately 91,000 tonnes per annum (TPA) of crops and agricultural waste (manures) and will produce 67,568TPA of liquid digestate and approximately 55,283TPA of solid digestate which will be stored and then exported from Site. Both the liquid and fibre digestate will be transported to destination farms for use as biofertiliser to confer agricultural benefit.
- 4.4 The proposed development would generate biogas, a proportion of which will be combusted in one of two on-site combined heat and power engines (CHPs) to produce heat and electricity to power the AD plant equipment and the remainder upgraded to remove contaminants, before producing biomethane and carbon dioxide (CO₂).
- 4.5 Biomethane will be removed from the site by tanker to a central facility where it will be injected into the National Grid. CO₂ produced as result of the upgrading process will be cleaned, liquefied, and transported by road to end users.

Assessment Objective and Scope

- 4.6 The AQIA assesses the potential impact of emissions to air during the construction and operational phase of the proposed development, on air quality at relevant receptor locations within the locale of the application site, by comparison to relevant guidelines for the protection of human health and conservation areas.
- 4.7 The assessment of air quality impacts and determination of mitigation measures is informed through:
- A review of relevant legislation, policy, and guidance.
 - A review of baseline conditions at the Site.
 - A review of emissions data supplied by proposed technology providers.
 - Assessment of construction phase impacts including qualitative assessment of traffic and dust.
 - Assessment of operational phase impacts including qualitative assessment of traffic, dust, bioaerosols and odour impacts. Atmospheric dispersion modelling of combustion and ammonia (NH₃) emissions is also undertaken, from which the dry deposition to sensitive conservation sites has been calculated. Combustion sources have been modelled at the specified Emissions Limit Values (ELVs) if ELVs exist for the sources and from data for similar plant at other sites if there are no ELVs.

- An evaluation of the significance of any potential short and long-term effects in relation to air quality assessment levels (AQALs) (i.e., limits, targets, objectives, and assessment levels) set in legislation and evaluation criteria provided in relevant guidance.

4.8 The pollutants considered in the AQIA include:

- Oxides of nitrogen (NO_x)
- Nitrogen dioxide (NO₂)
- Sulphur dioxide (SO₂)
- Carbon monoxide (CO)
- Total Volatile Organic Compounds (TVOCs)
- Benzene
- Hydrogen sulphide (H₂S)
- Ammonia (NH₃)
- Dust/ particulate matter (PM₁₀, PM_{2.5})
- Odour
- Bioaerosols

4.9 There are no AQS for TVOC but there is an AQS for benzene which is one of the volatile organic compounds (VOC) emitted. TVOC has been modelled as 10% benzene.¹

4.10 Predicted depositions have been compared with critical loads (CLOs) for nutrient nitrogen deposition (NDep) and acid deposition (AcidDep) at sensitive conservation sites.

4.11 Table 4-1 lists the sources of emissions to air that have been considered in this impact assessment and those potential sources not included.

Table 4-1 Sources of emissions to air

Source	Emissions	Operation profile
CHP 1, Jenbacher 321, 635kWe, fuelled by biogas (65% CH ₄ /35% CO ₂)	SO ₂ , TVOC, NO _x , CO	8,500 hours per year, 100% load (modelled as continuous)
CHP 2, Jenbacher 420, 1,560kWe, fuelled by natural gas (100% CH ₄)	TVOC, NO _x , CO	8,500 hours per year, 100% load (modelled as continuous)
2No. Boilers, Veissmann Vitoplex 200, 560kWtho, both fuelled by biogas (65% CH ₄ /35% CO ₂)	SO ₂ , NO _x , CO	50% load for approx. 4 months. Will only operate for maintenance outside of this period e.g., if CHP offline. (Modelled as continuous, 100% load).

¹ N R Passant (2002) Speciation of UK emissions of non-methane volatile organic compounds. Reference: AEAT/ENV/R/0545 Issue 1

Source	Emissions	Operation profile
Centrair exhaust from Chicken manure shed	Odour, NH ₃	Continuous
Emergency gas flare	TVOC, NO _x , CO	Safety feature used <10% of year. Modelled as continuous to determine short-term impacts. Long-term impacts based on 10% annual operation.
Three feed hoppers	Odour, NH ₃	Feed 37 minutes/hour. Modelled as continuous - 24h/day, 365 days/year.
Three dirty water tanks with vents	Odour, NH ₃	Continuous. Unabated emission from vents.
Separator Building	Odour, NH ₃	Continuous
Two 10,000m ³ digestate storage bags with 2No. vents per bag	Odour, NH ₃	Continuous
Tanker offtake for liquid digestate	Odour, NH ₃	Long-term impacts based on off-take profile between: 08:00-17:00; 5.5 days/ week; Feb-Sept. Modelled as continuous for short-term impacts.
Sources not included		
Emergency generator	SO ₂ , TVOC, NO _x , CO	Negligible long-term impact, likely to operate less than 50 hours/year.
Three slurry tanks	Odour, NH ₃	Emissions will be vented into a closed system.
Straw building	Odour	Negligible emissions of odour
Straw bunker	Odour	Negligible emissions of odour
Silage clamps	Odour	Negligible to low emissions of odour during storage
Digestate buffer tank	Odour, TVOC, NH ₃	Closed system, zero emissions except during pressure relief valve (PRV) operation (not used during normal operation)

Policy, Legislation and Guidance

National Planning Policy

National Planning Policy Framework (2021)

- 4.12 The National Planning Policy Framework was updated on 20 July 2021 and sets out the government's planning policies for England and how these are expected to be applied.
- 4.13 Under Section 15; Conserving and Enhancing the Natural Environment, Paragraph 174 states: *"Planning policies and decisions should contribute to and enhance the natural and local environment by: e) 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"*.
- 4.14 Paragraph 186 further states: *"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 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."*

Local Planning Policy

- 4.15 The proposed development site is situated within the administrative boundary of Wiltshire Council (WC) and is within close proximity to Gloucestershire County Council (GCC). Local policies relevant to the AQIA are outlined in Table 4-2.

Table 4-2 Local Policies

Policy/ Guidance	Policy wording
Wiltshire Core Strategy (Adopted 2015)	Core Policy 50 (CP50) Biodiversity and Geodiversity: Policy CP50, paragraph 6.72 states: <i>"For the purposes of evaluation in ecological impact assessment, the value of undesignated habitats and species should be measured against published selection criteria where possible. However, statutory protection will only ever apply to those sites which have been formally notified by Natural England."</i> CP50 also states that: <i>"Any development that would have an adverse effect on the integrity of a European nature conservation site will not be in accordance with the Core Strategy... Development proposals affecting local sites must make a reasonable contribution to their favourable management in the long-term."</i>
	Core Policy CP55 Air Quality: With reference to CP55, paragraph 6.116 of the strategy states that: <i>"Development which could potentially impact upon Natura 2000 sites through contributions to aerial deposition e.g., industrial process within 10km of a SAC, will require an assessment of the likely impacts in</i>

Policy/ Guidance	Policy wording
	<i>accordance with published guidance. Where mitigation is required this may be delivered through a local emissions strategy."</i> CP55 states: <i>"Development proposals, which by virtue of their scale, nature or location are likely to exacerbate existing areas of poor air quality, will need to demonstrate that measures can be taken to effectively mitigate emission levels in order to protect public health, environmental quality and amenity. Mitigation measures should demonstrate how they will make a positive contribution to the aims of the Air Quality Strategy for Wiltshire and where relevant, the Wiltshire Air Quality Action Plan."</i>
Saved Policies of North Wiltshire Local Plan 2011 (Adopted June 2006)	Policy NE18 Noise and Pollution states that: <i>"Development will only be permitted where it would not generate, or itself be subject to, harm upon public health or cause pollution to the environment by the emission of excessive noise, light intrusion, smoke, fumes, other forms of air pollution, heat, radiation, effluent or vibration."</i> Paragraph 6.51 of the Local Plan states that <i>"to minimise the air pollution from roads and buildings, development proposals will be expected to incorporate suitable landscaping to help remove air borne pollutants and particulates."</i>
Air Quality Action Plan for Wiltshire June 2015	The Air Quality Action Plan for Wiltshire was produced in June 2015 by Wiltshire Council in response to declaration of Air Quality Management Area (AQMA) within the county, of which there are eight. The AQAP sets out the strategic and locally generated actions that will be implemented to improve air quality and work towards meeting the air quality objectives. The primary source of pollutants in these AQMAs are due to vehicle emissions.
Air Quality Strategy for Wiltshire 2019 - 2024	The strategy sets out the approach to improving air quality across the county. The strategy provides a link between wider council strategies and the evidence base in order to improve air quality.

European and UK Air Quality Legislation

- 4.16 Whilst the UK has left the European Union (EU), the EU Withdrawal Act 2018 brought all EU laws and regulations, made while the UK was a member of the EU, into UK law by creating a new category of UK law: EU retained law. Therefore, the EU Directives listed in this section still apply in the UK.
- Directive 2008/50/EC: Ambient Air Quality Directive and 4th Daughter Directive contain Limit Values and Target Values with which the UK must comply.
 - The UK Air Quality Strategy (2007): Part IV of the Environment Act 1995. The Limit values for the protection of human health and ecosystems applicable to the scope of this assessment are presented in Table 4-4.

- Air Quality Standards Regulations (2010) and subsequent amendments including the Air Quality standards (Amendment) Regulations 2016. The Air Quality Standards relevant to this assessment are listed in Table 4-4.
- For substances not specified in the regulations, Environmental Assessment Levels (EALs) as provided in Defra/Environment Agency (EA) Air Emissions Risk Assessment Guidance ('AERA') are included and are also presented in Table 4-4.
- National Emissions Ceiling Regulations 2018 sets emission reduction commitments for: SO₂, NO_x, non-methane volatile organic compounds (NMVOCs), NH₃ and PM_{2.5}.
- Medium Combustion Plant Directive (MCPD). The relevant ELVs for the proposed new engines using biogas and natural gas during the operational phase, used in this assessment, are those defined in Part 2 of Annex II of the MCPD.
- The UK Environment Act 2021 aims to deliver improvements in air quality and brings into force the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 which sets the two PM_{2.5} targets (Table 4-4)

- 4.17 The AQOs and other Limit Values apply in non-occupational near ground level outdoor locations where a person might reasonably be expected to be exposed over the relevant averaging period.
- 4.18 New development should be designed to ensure that it does not cause environmental pollution, which may then be controlled and regulated by other agencies. The control of pollution is governed by the Environmental Protection Act (1990) and related legislation.
- 4.19 Adverse impacts of odour may include dis-amenity, 'annoyance', 'nuisance' and possibly complaints. Currently, there are no statutory standards for assessing odour annoyance nor nuisance in the UK.
- 4.20 Statutory standards exist for concentrations of suspended particulate matter (PM₁₀, PM_{2.5}), set under The Air Quality Standards Regulations 2010 (Table 4-4) for the protection of human health. However, there are no UK or European statutory standards that identify when deposited dust causes annoyance or dis-amenity.
- 4.21 The provisions of the environmental permit will regulate and control odour and dust emissions from the Proposed Development.

Legislation for the Protection of Ecosystems

- 4.22 Relevant legislation for the protection of ecological receptors includes:
- The Wildlife and Countryside Act 1981
 - Habitats Directive 1992
 - The Conservation of Habitats and Species Regulations 2017

Planning Guidance for Air Quality Assessment

- 4.23 The approach of the AQIA follows that of assessment criteria provided in relevant guidance outlined in Table 4-3.

Table 4-3 Relevant Guidance

Document	Scope
Traffic Exhaust Emissions	Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, Highways Agency, May 2007 ('DMRB, 2007')
	Environmental Protection UK (EPUK)/ Institute of Air Quality Management (IAQM) (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2 ('IAQM, 2017')
Dust	Institute of Air Quality Management (IAQM) (2016) Guidance on the assessment of dust from demolition and construction ('IAQM, 2016 ^(a) ')
	IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning ('IAQM, 2016 ^(b) ')
Odour	Environment Agency (EA) (March 2011) Technical Guidance Note H4 - Odour Management. How to comply with your environmental permit ('H4, 2011')
	IAQM Guidance on the assessment of odour for planning – version 1.1 (2018) ('IAQM, 2018')
Bioaerosols	EA (2011) Composting and potential health effects from bioaerosols: our interim guidance for permit applicants Position Statement 031 Version 1.0
	EA (2018) Technical Guidance Note (Monitoring) M9 Environmental monitoring of bioaerosols at regulated facilities Version 2 ('M9, 2018')
	EA (September 2022) Biological waste treatment: appropriate measures for permitted facilities ('EA Appropriate Measures guidance, 2022')
Protection of Ecosystems	IAQM guide to the assessment of air quality impacts on designated nature conservation sites (2020) ('IAQM, 2020')
Technical guidance on detailed modelling	EA (2014) AQTAG06 - Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air ('AQTAG06, 2014')
	Defra (August 2022) Local Air Quality Management Technical Guidance (TG22) ('TG22, 2022')

Document	Scope
Significance Criteria	Environmental Protection UK (EPUK)/ Institute of Air Quality Management (IAQM) (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2 ('IAQM, 2017')
	EA/Defra Air emissions risk assessment for your environmental permit guidance (2023) ('AERA guidance, 2023')

Assessment Criteria

Air Quality Assessment Levels

- 4.24 The impact of emissions to air is assessed against environmental standards, that include Limit Values, Objectives and EALS for human health. These standards are collectively referred to as Air Quality Assessment Levels (AQALs) herein and are presented in Table 4-4.

Table 4-4 Air Quality Assessment Levels

Substance	Emission period	Limit (average)	Standard	Exceedances ¹
Ammonia	1-hour	2,500µg/m ³	EAL	None
Ammonia	Annual	180µg/m ³	EAL	None
Benzene	24-hour	30µg/m ³	EAL	None
Benzene	Annual	5µg/m ³	Limit Value	None
Carbon monoxide	8 hour running average across a 24-hour period	10,000µg/m ³	Limit Value	None
Hydrogen sulphide	24-hour	150µg/m ³	EAL	None
Hydrogen sulphide	Annual	140µg/m ³	EAL	None
Nitrogen dioxide	1-hour	200µg/m ³	Limit Value	Up to 18 1-hour periods
Nitrogen dioxide	Annual	40µg/m ³	Limit Value	None
Particulates (PM ₁₀)	24-hour	50µg/m ³	Limit Value	Up to 35 times a year
Particulates (PM ₁₀)	Annual	40µg/m ³	Limit Value	None
Particulates (PM _{2.5})	Annual	20µg/m ³	Limit Value	None

Substance	Emission period	Limit (average)	Standard	Exceedances ¹
Particulates (PM _{2.5})	Annual	10µg/m ³	Target to be met by 2040 ⁽²⁾	None
Sulphur dioxide	15 minutes	266µg/m ³	UK Air Quality Strategy Objective	Up to 35 15-minute periods
Sulphur dioxide	1-hour	350µg/m ³	Limit Value	Up to 24 1-hour periods
Sulphur dioxide	24-hour	125µg/m ³	Limit Value	Up to 3 24-hour periods

Notes:
 Air Quality Standards Regulations 2010 Limit Values, UK Air Quality Strategy Objectives and EALS for human health. Standards taken from <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>
¹ Number of times a year the limit may be exceeded.
² Environmental Targets (Fine Particulate Matter) (England) Regulations 2023, as required by UK Environment Act 2021.

Environmental Standards for Conservation Sites

- 4.25 Table 4-5 sets out the environmental standards for the pollutants relevant to this assessment for ecological receptors. The standards in Table 4-5 are 'Critical Levels' (Cles), that are limits for concentrations of pollutants in air.

Table 4-5 Environmental standards for protected conservation areas

Substance	Target	Standard	Emission period
Ammonia ¹	1µg/m ³ where lichens or bryophytes (including mosses, landworts and hornworts) are present. The value specified in the Woodland Trust guidance of 3µg/m ³ where they are not present.	Limit Value	Annual
SO ₂	10µg/m ³ where lichens or bryophytes are present 20µg/m ³ where they are not present	Target Value ¹ and EAL	Annual
NOx (expressed as nitrogen dioxide (NO ₂)) ¹	30µg/m ³	Limit Value	Annual
NOx (expressed as NO ₂)	75µg/m ³	EAL	Daily
NOx (expressed as NO ₂) ²	200µg/m ³	EAL	Daily

Nutrient nitrogen deposition (NDep)	Depends on location, use www.apis.ac.uk to find values	EAL	Annual
Acidity deposition (AcidDep)	Depends on location, use www.apis.ac.uk to find values	EAL	Annual
Notes: Information from https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit . 1 20µg/m ³ is a Limit Value for nature or conservation sites. 2 Only for detailed assessments where the ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10µg/m ³ .			

- 4.26 CLes may vary depending on the sensitive features of the habitat. AQALs that are limits for deposition for nutrient nitrogen (NDep) and deposition of acid species (Acid Dep), are referred to as 'Critical Loads' (CLOs) which also vary spatially and with habitat. Values of the CLes and CLOs for the most sensitive species/habitat are detailed within the AQIA.

Methodology

4.27 The assessment methodology comprised four parts:

- Baseline conditions assessment at the Site and the surrounding area: background concentration and deposition
- Screening potential impacts against a threshold to determine whether detailed modelling is required.
- Modelling of impacts: assessment of the likely changes in concentration and deposition due emissions from the sources listed in Table 4-1. The assessment was undertaken using the ADMS 5 dispersion model and model parameters (detailed within the AQIA)
- Assessment of significance: paragraphs 4.47 to 4.61 describes the tests of significance for permitting and planning.

Baseline conditions

4.28 The baseline assessment has used the latest available monitored and modelled data to establish the current state of the environment.

Vehicle Emissions Assessment

4.29 The requirement for detailed assessment of potential road vehicle emissions impact during the construction and operational phase has been determined in accordance with the following guidance:

- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 (2007), Highways Agency; and
- Land-use Planning and Development Control: Planning for Air Quality. v1.2 (2017), EPUK/IAQM.

Construction Dust/ Particulate Matter

4.30 The construction phase of the proposed development will include earthworks and construction for the development of the AD facility infrastructure.

4.31 The potential for annoyance, is directly related to the existing baseline dust levels, the number and proximity of residential areas to the site, and the exact nature of the activities on-site.

4.32 A qualitative assessment of the dust generation potential of the operation has been undertaken based on IAQM guidance on the assessment of the impacts of construction on air quality (IAQM, 2016^a). The assessment method takes account of construction activities that are divided into categories to reflect their different potential impacts. Those relevant to the assessment include:

- earthworks – the processes of soil-stripping, ground-levelling, excavation and landscaping;
- construction – an activity involved in the provision of a new structure; and

- trackout – the transport of dust and dirt from the site onto the public road network.

4.33 The risk of dust effects is determined by:

- The scale and nature of the works, which determines the risk of dust arising;
- The proximity of sensitive receptors.

4.34 The detailed assessment is a five-stage process, as summarised in the appended AQIA.

Odour

4.35 A qualitative risk-based odour assessment has been undertaken that follows the risk assessment framework set out in IAQM (2018) guidance.

4.36 The IAQM method follows the Source-Pathway-Receptor (S-P-R) approach to establishing whether an odour impact could occur. The scope of the evaluation includes:

- A review of the proposed infrastructure at the site of the proposed AD Plant.
- An assessment of the likely magnitude and nature of odour emissions that may be generated.
- Completion of a qualitative risk-based odour assessment to assess the risk of off-site odour impact occurring during the normal operation of the Proposed Development.

4.37 The framework set out by IAQM (2018) guidance has been used to estimate the risk of impact occurring and likely magnitude of the impact is outlined in the AQIA.

Bioaerosols

4.38 EA Appropriate Measures guidance (2022) requires a site specific bioaerosol risk assessment (SSBRA) where a treatment process is located within 250m of a sensitive receptor. In circumstances where a receptor is not located within 250 metres of the proposed operation and there will be no further treatment such as composting digestate fibre in the open taking place, then it is considered that the potential impacts would have insignificant effects and no further risk assessment is required.

Modelling of air quality impacts

4.39 The dispersion model used to predict ambient concentrations due to the stack emissions was ADMS 5 (version 5.2.2.0).

4.40 It requires as input: data on the source of emissions and the mass emission rates of each pollutant, meteorological data and associated parameters, buildings data, terrain data, and receptor locations. Full details of the meteorological, buildings and receptor data are described in the AQIA.

4.41 The outputs calculated by the model are the air concentrations of pollutants from the sources modelled for the relevant averaging times and statistics. The contribution from the modelled

sources on the Site to air concentration and to deposition rate are referred to the Process Contribution (PC), which is then compared with the relevant AQALs.

- 4.42 When background concentration or deposition rate are added to the PC, the totals are referred to as Predicted Environmental Concentration (PEC) and Predicted Environmental Deposition Rate (PEDR) respectively, which are also compared with the relevant AQALs.
- 4.43 From air concentration of NO₂ and NH₃ the deposition rate of nitrogen can be calculated and the acid deposition due to nitrogen; from the air concentration of SO₂ the contribution of sulphur to acid deposition.

Model options

- 4.44 Models have been run for each of the five years of meteorological data (2017-2021) for three combinations of model option scenarios.
- 4.45 Results at the receptors were calculated as the maximum value at each receptor from these 15 model runs and are therefore worst-case values across all five years and considering flat terrain, buildings, and hills.

Sources and emissions

- 4.46 The source geometry, parameters, Emission Limit Values (ELVs), design emission limits and calculated emissions are detailed within the AQIA for point sources: CHP 1, CHP 2, the emergency flare, 2No. back-up boilers, Centriair odour abatement exhaust stack, 4No. digestate storage bag vents, 3No. dirty water tank vents, 1No. tanker vent, and for volume sources including 3No. feed hoppers and the Separator building.

Significance of Results

Human receptors

- 4.47 IAQM (2017)**Error! Bookmark not defined.** guidance outlines a method to assist with the determination of potential air quality impacts of planning proposals, to be applied alongside professional judgement.
- 4.48 The IAQM (2017) guidance provides a framework for describing impacts based on the change in the concentration from the scheme relative to the AQAL and the overall concentration including the scheme, that is, the future background concentration plus the process contribution from the scheme. The matrix in Table 4-6 is intended to be used with annual mean concentrations.

Table 4-6 Impact descriptors for individual receptors – long term concentrations

Long Term Average Concentration	% Change in Concentration relative to AQAL			
	1	2 – 5	6 – 10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Notes: From IAQM (2017) Land-use Planning guidance ^{Error! Bookmark not defined.}				

- 4.49 The outcome of the assessment procedure represented in Table 4-6 applies to an individual receptor and not the overall impact; the overall significance is determined alongside professional judgement.
- 4.50 IAQM guidance provides additional criteria for the assessment of the impacts of ‘peak’ short-term concentrations, specifically those averaged over a period of 1-hour or less and where exposure from an elevated source at a receptor may be regarded as ‘acute’.
- 4.51 Table 4-7 summarises the impact descriptors. This approach to the assessment of short-term impacts does not include consideration of background concentrations, that is the calculation of PEC is not required. In these circumstances, baseline concentrations and the peak concentrations are not additive.

Table 4-7 Impact descriptors for individual receptors – short term concentrations

% Change in Concentration relative to AQAL	Magnitude of change	Severity of impact
<10%	Negligible	Negligible ¹
11 – 20 %	Small	Slight
21 – 50%	Medium	Moderate
>51%	Large	Substantial
Notes: Based on criteria provided in IAQM (2017) Land-use Planning guidance ¹ Adopted from EA threshold criterion of 10% of the short term AQAL, below which an impact is regarded as having an insignificant or ‘negligible’ effect.		

- 4.52 For the assessment of short-term impacts averaged over periods longer than 1-hour, for example a 24-hour period, criteria set out in EA/Defra 'AERA' (2023) guidance has been followed in determining the significance of results.
- 4.53 The EA/Defra AERA (2023) guidance considers initial screening and then detailed modelling. At the initial screening stage, a PC can be screened out from further assessment if:
- the short-term PC is less than 10% of the short-term environmental standard
- 4.54 The second stage of screening considers the background concentration as well as the PC. The Predicted Environmental Concentration (PEC) is the sum of the PC and background concentration. A further assessment is not needed if:
- the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration (i.e., less than 20% of the available **headroom**)
- 4.55 If the PC cannot be screened out on that basis, the guidance outlines further steps which may lead to a requirement to carry out a cost-benefit analysis.

Ecological receptors

- 4.56 IAQM (2020) guidance follows EA/ Defra AERA (2023) guidance which states that when there are SPAs, SACs, Ramsar sites and SSSIs (within the relevant screening distance), the emissions can be considered insignificant if:
- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas
 - the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas
- 4.57 If these criteria are not met the next stage is to test:
- Whether the long-term PEC is less than 70% of the long-term environmental standard
- 4.58 If the PEC is less, no further assessment is needed. If the PEC does not meet the criterion, or if the short-term PC exceeds the previous screening criteria, detailed modelling is required.
- 4.59 When there are local nature sites within the specified distance, the emissions do not need to be assessed further if:
- the short-term PC is less than 100% of the short-term environmental standard
 - the long-term PC is less than 100% of the long-term environmental standard If these criteria are not met, further assessment is required.
- 4.60 Therefore, in accordance with the EA/Defra AERA (2023) approach, further calculation of PEC for local nature sites is not required to support an impact assessment.

Overall Significance

- 4.61 Generally, where the overall effect for a receptor is greater than “slight adverse”, the effect is likely to be considered significant. A ‘significant’ effect does not mean that the proposal is unacceptable - further consideration should be given to additional mitigation measures and balanced against benefits of the proposal.

Baseline

- 4.62 The site is located approximately 1.8km north of the village of Ashton Keynes. Land use within the locale is primarily agricultural. The wider environs surrounding the Site include the Cotswold Water Park SSSI; comprised of more than 140 lakes, following sand and gravel extraction.
- 4.63 The Site centre is at an elevation of approximately 96mAODm. The topography falls from west to east across the site, with a change in elevation of approximately 10m. Beyond the site, the topography rises to 251mAOD 15km to the northwest of the Site and falls further east (to an elevation of 80mAOD within 1km of the Site).
- 4.64 The proposed Site is not located within or in proximity to an Air Quality Management Area (AQMA). The closest AQMA is approximately 16km to the southeast.
- 4.65 Within the locale there are scattered residential clusters; the closest residential receptor include buildings and gardens associated with the Cotswold Community (residential redevelopment) site, are located 335m to the southwest. The Site is situated 120m north of Aggregate Industries, that provides ready-mix concrete, crushed stone, and gravel. A Trading Estate/ Business Park is situated approximately 526m to the east. Table 4-9 lists the human receptor locations evaluated, that are further detailed within the AQIA.
- 4.66 The nearest nationally and EU-designated ecological conservation sites within relevant screening distance criteria are detailed within the appended AQIA. There are 18 designated sites within 10km of the Site. The Cotswolds Water Park (CWP) Site of Special Scientific Interest (SSSI) sits approximately 300m to the west and 300m to the southeast and east of the Site. The Site is within 3km of EU-designated North Meadow and Clattinger Farm Special Area of Conservation (SAC).

Local monitoring of background concentrations

- 4.67 Cotswold District Council does not operate any automatic monitoring sites. In 2019, i.e., the latest year for which data are unlikely to be affected by the Coronavirus (COVID-19) pandemic, CDC operated a network of 16 diffusion tubes for the monitoring of NO₂.
- 4.68 The nearest monitoring sites are roadside location diffusion tubes 'NAS34' and 'NAS35', located 3.8km and 4.4km to northwest of the Site respectively. From the monitoring data available, it can be concluded that NO₂ concentrations in the vicinity of the Site are sufficiently below the annual mean AQAL (Table 4-8).

Table 4-8 Annual Mean NO₂ Monitoring Results (2016 - 2020)

Site ID	NGR X	NGR Y	Type of site	NO ₂ Annual Mean Concentration (µg/m ³) (4) (5)				Distance from site (km)
				2017	2018	2019	2020	
NAS34	402394	199581	Roadside	9.6	9.5	9.3	7.4	3.8
NAS35	402439	200297	Roadside	9.4	9.4	9.9	7.0	4.4

National mapping of concentrations/ Defra modelled background

- 4.69 Defra background concentrations at each receptor for the year 2019 were compared with the latest (pre-Covid) year of monitoring data (Table 4-8).
- 4.70 The maximum Defra background NO₂ values, 7.68µg/m³ (Table 4-9) is in broad agreement with the nearest roadside pre-Covid background monitoring location data (for 2019) measured at roadside locations (9.9µg/m³).
- 4.71 To account for receptor locations situated at roadside locations within the study area, the higher measured NO₂ background value of 9.9µg/m³ for 2019 (Table 4-8) has been used in the assessment to calculate the PEC and PEDR as a precautionary approach.

Table 4-9 Defra background mapped 2019 concentrations at each Human receptor

Receptor ID	2019 Annual mean background concentration					
	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	Benzene (µg/m ³)	CO (mg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (mg/m ³)
H1	6.36	2.30	0.17	0.10	13.1	8.35
H2	7.68	2.86	0.18	0.10	13.5	8.65
H3	7.68	2.86	0.18	0.10	13.5	8.65
H4	6.36	2.30	0.17	0.10	13.1	8.35
H5	6.77	2.20	0.16	0.10	12.5	8.34
H6	7.64	2.27	0.18	0.10	14.0	9.52
H7	7.68	2.86	0.18	0.10	13.5	8.65
H8	7.64	2.27	0.18	0.10	14.0	9.52
H9	7.64	2.27	0.18	0.10	14.0	9.52
H10	7.68	2.86	0.18	0.10	13.5	8.65
H11	6.30	2.03	0.17	0.10	13.5	8.41
H12	7.01	2.15	0.19	0.10	13.3	8.52
H13	6.22	2.02	0.17	0.10	12.9	8.23
H14	7.59	2.28	0.19	0.10	13.0	8.49
H15	7.64	2.27	0.18	0.10	14.0	9.52
H16	6.30	2.03	0.17	0.10	13.5	8.41
H17	7.15	2.07	0.17	0.10	13.6	8.38
H18	7.68	2.86	0.18	0.10	13.5	8.65
H19	7.68	2.86	0.18	0.10	13.5	8.65
H20	6.30	2.03	0.17	0.10	13.5	8.41
H21	7.68	2.86	0.18	0.10	13.5	8.65
H22	7.64	2.27	0.18	0.10	14.0	9.52
H23	7.68	2.86	0.18	0.10	13.5	8.65
H24	6.30	2.03	0.17	0.10	13.5	8.41
Notes: Concentrations are for 2019 except for the following: SO ₂ 2001, CO 2001, Benzene 2010.						

Background concentrations at sensitive conservation sites

- 4.72 Background concentrations of NO_x, SO₂ and NH₃ at the ecological receptors have been obtained from APIS designated site-specific values for SSSIs, SACs and SPA which are provided on a 1km basis, and the APIS location-specific values for the Local Wildlife Sites (LWS), National Nature Reserves (NNRs), Local Nature Reserves (LNRs) and Ancient Woodland (AW) provided on a 1km to 5km basis; they are an average for the years 2018-2020.
- 4.73 Site relevant background deposition fluxes for nutrient nitrogen deposition (NDep) are provided by APIS on a 1km grid cell basis with values for deposition to woodland, moorland, and a grid-averaged value.

Background deposition

- 4.74 Site relevant acid deposition due to nitrogen (NAcidDep) and sulphur (SAcidDep) are also supplied by APIS on a 1km grid cell basis. The AQIA details the background nutrient nitrogen and acid deposition rates respectively for the relevant ecological receptors, for the habitats that are most sensitive to nitrogen and acid species.
- 4.75 For nationally designated sites there are site-specific values of background and critical load; for the locally designated sites, the NNRs, LNRs, LWS and AW, spatially varying values of background level are available for the broad habitat class.

Dust/ Particulate Matter

- 4.76 The closest potential dust source, which may influence baseline levels of dust, is 'Aggregate Industries North End' which provides aggregates, ready-mix concrete, crushed stone, gravel located approximately 120m to the southeast of the Site.
- 4.77 As shown in Table 4-9, the maximum PM₁₀ concentration for any receptor considered within the study is 14.0µg/m³, based on 2019 measured concentrations, that are assumed to be representative of background concentrations at both the site and the locale as a conservative approach.

Odour

- 4.78 Land use in the locale of the site is principally associated with arable agriculture. Therefore, activities such as the application of manufactured fertiliser and organic manures may periodically characterise baseline odours. Within the wider locale, cattle and poultry farms may also account for localised odours.
- 4.79 Data available from the Environment Agency Public Register² indicate that three waste licenses are held for the deposit of waste to land as a recovery operation, that may include land spreading for agricultural benefit and produce odours analogous to the other arable land spreading activities.

² Environment Agency Public Registers Online (<https://environment.data.gov.uk/public-register/view/index>) Accessed March 2023.

- 4.80 Baseline odours may also include the Cirencester Wastewater Treatment Works (WwTW), located at Ashton Road, Siddington, approximately 1km northwest of the Site.

Bioaerosols

- 4.81 Bioaerosols are found naturally within the environment and consist of airborne particles that contain living organisms or parts of living organisms.³ AD facilities process feedstock materials that may be a source of bioaerosols and/or depend on microorganisms to degrade the organic material, and therefore can be a source of bioaerosols.
- 4.82 Localised concentrations of bioaerosols will be influenced primarily by the surrounding vegetation, including woodland, in addition to agricultural activities within the wider area.

³ Environment Agency (2018) Technical Guidance Note (Monitoring) M9 Environmental monitoring of bioaerosols at regulated facilities July 2018 Version 2.

Impact Assessment – Construction Phase

Vehicle Emissions from Construction Phase Traffic

- 4.83 As detailed within Chapter 9 (Transport) it is anticipated that the construction process would generate less Heavy Duty vehicle (HDV) traffic than the proposed development operational phase with approximately 7,296 HDV trips forecast across the whole construction period.
- 4.84 This equates to an average of 27 HDV trips per day (or 54 HDV movements, 27 in and 27 out) across a 275-day year.
- 4.85 There would be up to 50 personnel on site during the peak of construction activity. This represents a worst-case in Light Duty Vehicle (LDV) vehicle use as many contractors would vehicle share.
- 4.86 In accordance with IAQM (2017) guidance, air quality screening criteria are set in terms of Annual Average Daily Traffic (AADT) flows, defined as the average 24-hour traffic volume at a given location over 365 days/year.
- 4.87 In terms of AADT, the anticipated construction vehicle movements equate to the following:
- Based on the 'peak' number of 50 staff/ contractors that may be on-site any one time during the construction phase, the total daily off-site LDV movements predicted for the construction phase (worst case scenario) would be 72 LDV AADT flows (36 arrivals and 36 departures) over 365 days.
 - Total daily off-site HDV movements predicted for the construction phase (worst case scenario) would equal 40 HDV AADT flows (maximum) (20 arrivals and 20 departures) over 365 days.
- 4.88 These AADT flows represent a worst-case scenario as the LDV and HDV AADT have been calculated based on all construction phase traffic movements as occurring over a period of one year (52 weeks), rather than the expected 70-week construction period.
- 4.89 In accordance with the DMRB (2007) and IAQM (2017) criteria, the predicted increase in HDV and LDV AADT as a result of construction phase traffic are within screening criteria, above which would require further detailed assessment, for locations not within or adjacent to an AQMA.
- 4.90 On the basis that further detailed assessment is not required, it is considered that the air quality impacts associated with road traffic emissions as a result of the construction phase would have insignificant effects.

Construction Dust

Initial screen

- 4.91 IAQM (2016)^a guidance prescribes initial screening criteria to determine the requirement for a detailed assessment.
- 4.92 In accordance with the screening criteria and dust assessment method outlined in the appended AQIA, an assessment is required where:
- there are human receptors within 350m of the site boundary, and
 - within 100m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s)
 - For ecological receptors assessment is required where a receptor is situated within 50m from the site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s).
- 4.93 Whilst there are no ecological receptors within 50m from the site boundary, there are ecological receptors within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s). Based on the screening distance criteria, an assessment of dust impacts on human and ecological receptors is required.
- 4.94 The construction phase will involve earthworks, construction of site infrastructure and track out from vehicles. Potential sources of impacts associated with these activities include fugitive dust and PM₁₀ emissions resulting from disturbance of dusty materials by construction plant, vehicle movements and wind action. The risk of dust impacts has been assessed for each activity in accordance with IAQM (2016)^a guidance.

Defining the Potential Dust Emission Magnitude

- 4.95 Construction activities at the Site will run concurrently, with the exception of the earthworks phase, that has the potential to result in the largest dust impacts.
- 4.96 The initial preparation and earthworks at the AD facility site will involve initial site strip of vegetation and topsoil followed by site levelling and landscaping. The total site area is approximately 7 Ha. There will be a requirement to export excavated material and import stone to achieve final profiles.
- 4.97 The dust magnitude for each construction activity is outlined in Table 4-10.

Table 4-10 Dust Emission Magnitude

Activity		Dust Emission Magnitude
Demolition		
The Site is currently undeveloped agricultural land.		Not applicable
Earthworks		
The scale of the earthworks may be considered to result in a potential dust emission class that is 'large'. This classification is a function of: the total development site area (i.e. >10,000m²), the number of earth moving vehicles required (i.e. <5 vehicles), the soil types present on-site (sandstone and siltstone truncated by mudstone⁴), the formation of bunds between 4 – 6m in height, and the volume of total material to be re-worked (expected to be approximately 44,000m³). The earthworks phase of construction will be relatively short lived, lasting for approximately 8 weeks.		Large
Construction		
The potential dust emission class for activities associated with construction of the AD Plant infrastructure is considered to be 'medium', based on a total building volume of 25,000 - 100,000m³; the use of prefabricated and pre-cast concrete elements for on-site construction (e.g., silage clamp side wall units, prefabricated building components and storage tanks) that would not give rise to dust. Further there would be no requirement for on-site crushing or screening or concrete batching; all concrete would be delivered ready-mixed from local suppliers.		Medium
Trackout		
Trackout from the site may occur from the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The dust emission class for the effects of trackout is considered to be 'large', as a function of a maximum of >50 HDV (>3.5t) in any given day. The internal access roads and areas of hardstanding on the proposed AD site are to be constructed during the final stages. For the majority of the construction phase at the AD site the average unpaved on-site road length will be of between 50 - 100m.		Large

⁴ Groundsure Report 12/09/2022 Land off Ashton Road, Ashton Keynes, Wiltshire, SN6 6QX. Ref: GS-9047296.

Defining the Sensitivity of the Area

Dust soiling

- 4.98 There are no sensitive receptors within 100m of the site. The nearest 'high' sensitivity receptors to the site boundary, and therefore relevant to earthworks and construction phases, include (H1) which represents the gardens of the Cotswold Community residential cluster located 335m to the southwest, and H2 (residential properties 343m to the north).
- 4.99 Therefore, there are high sensitivity receptors located at a distance of more than 200m (but <350m) from the site. There are no receptors within 50m of the routes used by construction vehicles up to 500m from the site entrance.
- 4.100 In accordance with criteria set out in IAQM (2016) guidance, the sensitivity of the area to dust soiling effects on people and property from earthworks, construction and trackout is therefore considered to be 'low'.

Human health effects

- 4.101 The maximum annual mean PM₁₀ concentration for any receptor considered within the study is 14.0µg/m³ (Table 4-9) based on 2019 measured concentrations, that are assumed to be representative of background concentrations at both the site and the locale as a conservative approach.
- 4.102 There are therefore 10 – 100 high sensitivity receptors located more than 200m from the Site with an annual PM₁₀ concentration of <24µg/m³. There are no receptors within 50m of the routes used by construction vehicles up to 500m from the site entrance.
- 4.103 In accordance with the IAQM (2016) criteria, the sensitivity of the area to human health impacts from earthworks, construction and trackout is therefore considered to be 'low'.

Ecological Receptor Sensitivity

- 4.104 The nearest nationally designated ecological conservation site to the Proposed Development is the Cotswold Water Park SSSI, located approximately 380m to the south of the site entrance, and, at the closest extents of the designation, within 50m of routes potentially used by construction vehicles.
- 4.105 The main habitat of the SSSI is 'standing water'.⁵ The Natural England citation for the CWP SSSI, states that it is of special interest for breeding birds, non-breeding birds, and

⁵ Air Pollution information System (APIS) (<https://www.apis.ac.uk/app>) Accessed March 2023.

Charophytes (stoneworts)^{6, 7} that are a submerged species that live in a variety of wetland and freshwater or brackish habitats.⁸

- 4.106 APIS does not list any sensitive habitats or species for the SSSI designation. It is therefore considered that the interest features the standing water habitat are unlikely to be sensitive to the impacts of construction dust deposition and the designation is of 'low' sensitivity. Furthermore, there is pre-existing screening in the form of vegetation (dense hedgerows and trees) on both sides of the potential routes used by construction vehicles and the ecological receptor.
- 4.107 Based on the distance from the Site, the ecological sensitivity of the area to earthworks and construction activities is considered to be 'low'.
- 4.108 Factoring distance from the site (only a relatively small area of the SSSI is within 500m of the site entrance), the spatial extent of the area potentially affected (with only the closest extents within 50m of routes potentially used by construction vehicles), and the low sensitivity of the interest features of the designation to dust, the ecological sensitivity of the area to trackout activities is considered to be 'low'.
- 4.109 A summary of the outcome for defining the sensitivity of the area to impacts is provided in Table 4-11.

Table 4-11 Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Human Health	Low	Low	Low
Ecological	Low	Low	Low

⁶ Natural England Cotswold Water Park SSSI Gloucestershire, Oxfordshire, Wiltshire Notifications under Sections 28C and 28D of the Wildlife and Countryside Act 1981 (https://consult.defra.gov.uk/natural-england/cotswold-water-park/supporting_documents/Cotswold%20Water%20Park%20Notification%20Document%20notified%207%20Jan%202020.pdf)

⁷ Cotswold Water Park SSSI citation confirmed 1 Oct 2021 (<https://consult.defra.gov.uk/natural-england/cotswold-water-park/results>)

⁸ Environment Agency (March 2009) Stoneworts: their habitats, ecological requirements and conservation Integrated catchment science programme Science report: SC030202 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290960/scho0309bpsd-e-e.pdf)

Defining the Risk of Impacts

- 4.110 Table 4-12 presents the summary of dust risk as a function of the predicted dust emission magnitude (Table 4-10) and the sensitivity of the surrounding area (Table 4-11) in accordance with IAQM (2016) criteria.

Table 4-12 Summary of Dust Risk

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Human Health	Low	Low	Low
Ecological	Low	Low	Low

- 4.111 In accordance with IAQM (2016) methodology for assessing construction dust impacts on human and ecological receptors, the construction of the Proposed Development is considered to be of overall 'low risk'. The overall dust soiling and potential human health impact during the construction phase is therefore determined to be not significant.

Defining Site Specific Mitigation

- 4.112 Based on the application of the IAQM (2016) method to determine dust risk from the construction phase, the overall risk is determined to be 'Low' and the employment of construction best practice as a minimum would ensure that no problematic dust or PM₁₀ concentrations occur during the construction process.
- 4.113 IAQM Mitigation Measures recommended for a low-risk site, are provided in Table 4-27. The mitigation measures presented are required for all sites as a minimum standard and are designed to ensure that any potential impacts during the construction phase of the development are reduced to an acceptable level.

Impact Assessment – Operational Phase

Operational Phase Vehicle Emissions

- 4.114 During the operational phase, it is anticipated that there would be up to four on-site personnel in attendance each day on-site in addition to incidental visits associated with provision of spare parts and consumables and third-party technicians.
- 4.115 The projected number of LDV movements (cars and LDVs) associated with the operational phase are summarised in the AQIA.
- 4.116 The total number of annual two-way LDV movements during the operational phase of the proposed development, would equate to an LDV AADT of 8 movements per day i.e., 4 LDV arrivals and 4 LDV departures from the Site over 365 days.
- 4.117 The calculated annual HDV movements as provided in Chapter 9 (Transport).
- 4.118 During the operational phase approximately 12,530 HDV trips are forecast. This equates to an AADT of 68 HDV movements per day i.e., 34 HDV arrivals and 34 departures from the Site across 365 days.
- 4.119 In summary during the operational phase:
- An AADT flow of 8 LDV movements per day is forecast
 - An AADT flow of 68 HDV movements per day is forecast
- 4.120 Therefore, based on the average daily traffic flow projections and in accordance with the DMRB (2007) and IAQM (2017) screening criteria, it is considered that the potential air quality impacts associated with road traffic emissions as a result of the operational phase of the development would be insignificant and that no further detailed assessment is required.
- 4.121 It is important to note that whilst the proposed site traffic would be new to the application site, a large proportion of the traffic movements are already on the local network as the Proposed Development would service existing local farms which have an existing traffic generation. This has been quantified in Chapter 9 (Transport) as approximately 5,843 annual loads which make up a large proportion (47%) of the proposed 12,530 annual loads.

Operational Phase Dust Emissions

Dust Assessment Screening

- 4.122 IAQM (2016)^b guidance acknowledges that the greatest potential for high rates of dust deposition (large particles >30µm in size) and elevated PM₁₀ concentrations occur within 100m of a dust generating activity. Intermediate-sized particles (10 to 30µm) may travel up to 400m.
- 4.123 On this basis IAQM (2016)^b guidance prescribes simple initial distance-based screening criteria to determine the requirement for a detailed assessment. For mineral sites, a detailed dust assessment is required:
- For dust soiling ('dis-amenity dust') if there are relevant human and/or ecological receptors within 250m of dust generating activities involving soft rock (sand and gravel) or 400m (for hard rock e.g., granite)
 - For particulate matter (PM₁₀) if there are sensitive receptors within 1 km
- 4.124 There are no ecological receptors within 250m of proposed on-site dust generating operations although there are human receptors within 250m. Therefore, further assessment for the potential impact of deposited dust and PM₁₀ on human receptors is required.

Potential Dust Sources

- 4.125 The on-site activities that may have the potential to generate dust are outlined in Table 4-13.
- 4.126 As identified within paragraph 4.65, there is one potential third party dust source within the locale, located approximately 120m to the southeast of the Site.
- 4.127 As shown in Table 4-9, the maximum annual mean PM₁₀ concentration for any receptor considered within the study is 14.0µg/m³, assumed to be representative of background concentrations at both the site and the locale as a conservative approach.
- 4.128 The overall Residual Source Emissions, i.e., the potential dust emissions after designed-in mitigation measures have been taken into account, is considered to be 'Medium', as a conservative approach to take account of the nearby Aggregate Industries processing site.

Table 4-13 Potential Dust Sources

Process	Source Dust Potential
Feedstock delivery	Small – feedstock material will be delivered ‘fresh’ from source and with moderate moisture content, and/or delivered within an enclosed building, partially covered structure and/ or will be covered following receipt at the site.
Feedstock storage	Negligible to Small – feedstock stored under cover or within buildings.
Solids feeder loading	Small: The external hoppers are situated within close proximity of the clamps to minimise haulage distances. With the exception of straw, feedstock materials will have medium to high moisture content. Silage will be transferred using a front-end loader and carefully placed into the hoppers to limit any potential dust emissions.
Vehicle movements	Small: Movements restricted to operational areas that will be cleared regularly following un/loading.
Solid digestate storage	Small: solid digestate will have a moderate moisture content following separation and is unlikely to dry out significantly during temporary storage (typically 1 to 2 days) within the building.
Solid digestate off-take	Small: solid digestate will have a moderate moisture content. Loading periods will be intermittent and brief (once per day for 30 minutes duration).

Determination of pathway effectiveness of dust to receptor

- 4.129 The site-specific factors considered to determine the pathway effectiveness include distance, direction of receptors relative to the prevailing wind directions and wind speed.
- 4.130 As per IAQM (2016)^b guidance, the threshold wind speeds for initiation of wind blow can range from 2.4m/s ('light breeze') up to gale force, depending on the particle size. A moderate breeze, of 5.5m/s and above, may be used as a general threshold.
- 4.131 Directional wind data analysis, derived from Global Forecasting System (GFS) meteorological data for the Proposed Development site for a 5-year period is detailed within the AQIA. The prevailing wind directions are predominantly from the south southwest, southwest, west southwest and west.
- 4.132 The determination of the pathway effectiveness presented in Table 4-14 for each receptor is based on the distance between sensitive receptors and on-site dust generating activities and the frequency of wind speeds >5m/s that are towards the receptor.

Table 4-14 Estimation of pathway effectiveness

ID	Receptor Description	Nearest potential on-site dust source	Approx. distance from dust source	Wind sectors towards receptor	Approx. % of time winds >5m/s towards receptor	Frequency category	Receptor Distance category	Pathway effectiveness
H22	Footpath	Digestate loading	240	NW	0.78	Infrequent	Distant	Ineffective
H23	Footpath	Straw bunker	200	S	2.45	Infrequent	Intermediate	Ineffective
H25	Industrial	Digestate loading	190	NW	0.78	Infrequent	Intermediate	Ineffective

Determination of likely dust effect of the Proposed Development

- 4.133 The adopted approach is based on a qualitative risk assessment technique, that follows IAQM (2016)^b guidance for assessing the impacts from mineral workings. Following this approach, the source residual dust potential was determined to be 'Medium', as a conservative approach and to take account of the nearby Aggregate Industries processing site.
- 4.134 Based on the ineffective source pathway between the Proposed Development on-site activities and the low sensitivity of receptors, all of which are located >190m from the Site, the likely dust effect is predicted to be 'negligible' at the identified receptors (Table 4.15).

- 4.135 Overall, the potential dust soiling impact associated with the operation of the development is therefore considered to be 'not significant'.

Table 4-15 Determination of likely dust effects

ID	Description	Residual source emission	Pathway effectiveness	Dust Risk	Impact	Receptor Sensitivity	Magnitude of dust effects
H22	Footpath	Medium	Ineffective	Negligible Risk		Low	Negligible effect
H23	Footpath	Medium	Ineffective	Negligible Risk		Low	Negligible effect
H25	Industrial	Medium	Ineffective	Negligible Risk		Low	Negligible effect

Human health effects

- 4.136 It would be expected that the existing mineral workings and agricultural activities in the locale influence the current baseline dust/ particulate matter concentrations.
- 4.137 There are no high sensitivity receptors within 250m from on-site dust generating activities. The maximum annual background PM₁₀ concentration is 14µg/m³ for the 1km grid covering the Site and nearby receptors (Table 4-9). The 2019 background concentration represents approximately 35% of the AQAL for PM₁₀. Further, there has been a long-term decrease in background particulate matter (PM₁₀, PM_{2.5}) concentrations, in part due to reductions in road traffic exhaust emissions, and therefore the 2019 concentrations presented represent the more conservative estimate.
- 4.138 On this basis, it is considered that the proposed development would be very unlikely to increase background concentrations of PM₁₀ such that levels would exceed the relevant AQAL. It is therefore considered that the potential impact of PM₁₀ from the operation of the Proposed development on human health would be negligible and therefore not significant.

Impact assessment of air quality on human receptors

Odour

Source Odour Potential

- 4.139 The proposed development has been risk-assessed following the IAQM (2018) methodology in terms of the potential for odour impact in the locale.
- 4.140 A summary of the proposed processes at the AD Plant and corresponding source odour potential are provided in Table 4-16.
- 4.141 The AD plant will process up to 91,000 TPA, of which approximately 5% will comprise liquid feedstock material that will be delivered to the AD Plant in a sealed system with no on-site emission points.
- 4.142 Of the solid feedstock, 67% will comprise straw and crop silage, that will have negligible to low odour potential during delivery and storage although with the potential for moderate odours during transfer into the AD system following storage.
- 4.143 The remaining 28% will comprise manures that will contain moderately odorous compounds and will be stored temporarily within a building on-site, that will incorporate air extraction and treatment.
- 4.144 These materials, that include manures already produced and/or stored within the wider site locale, will be exposed to air for brief periods (<4 hours total per day), and only when required for loading.
- 4.145 Solid (fibre) digestate, that may also be moderately odorous, will be separated and temporarily stored within an on-site building (typically, for less than two days) prior to transfer off-site.
- 4.146 The potential for impact from these sources will be limited by restricted available storage at the site and short holding times. As a conservative approach, the overall source odour potential for the AD Plant is considered to be 'Medium'.

Table 4-16 Potential Odour Sources

Process	Source Odour Potential
Solid feedstock delivery	Medium: The odours from some feedstocks being transported e.g., manures, may be of medium to high intensity and offensiveness. On-site provision for storing poultry litter and manure will be within an enclosed building that includes an emissions extraction and abatement system. Selected, type and quality with waste acceptance criteria. Odours released during transfer will be analogous to baseline odours.
Liquid feedstock delivery	Negligible: on-site source odour potential
Solid Feedstock storage	Small: Low odour potential from covered silage clamp. Straw has a very low potential for odour and will be stored within a building. On-site provision for storing poultry litter and FYM will be within an enclosed building that includes an emissions extraction and abatement system so odour potential mitigated. Selected, type and quality with waste acceptance criteria.
Liquid Feedstock storage	Negligible on-site source odour potential due to containment.
Solids feeder loading/ operation	Medium: from transfer of silage and manures. After manure is placed into the hoppers, a 0.5m layer of silage will be used to cover the material within the feeders to reduce the potential for odour emissions. This method is used in preference to lids, which may cause heating and a build-up of odours which are then released in a burst as the lid is opened for loading.
Anaerobic digestion	Negligible on-site source odour potential
Digestate separation	Small: Residual release from building and/or when access is required.
Solid digestate storage and off-take	Low - medium: intensity and offensiveness odours, restricted quantities held on-site for limited periods of time (per batch within building).
Liquid digestate storage	Negligible to low on-site source odour potential
Combustion	Negligible on-site source odour potential
Biogas upgrading	Negligible on-site source odour potential during normal operations

Pathway effectiveness

- 4.147 Table 4-17 presents the estimation of pathway effectiveness, that considers the distance between the nearest on-site odour source and the receptor together with the frequency of winds.
- 4.148 The Pathway Effectiveness is determined to be 'ineffective' for all receptors considered, with the exception of a 'moderately effective' pathway to receptors H15 Aggregate Industries, and locations H22, H23, H24 selected as representative of footpaths to the northwest, south and east of the Site respectively.

Table 4-17 Estimation of pathway effectiveness for receptors within the locale of the AD Plant

ID	Description	Nearest odour source	potential	Approx. distance from odour source	Receptor bearing from source	Approx. % of time winds from source to receptor	Pathway effectiveness
H1	Residential	Storage bag 1		400	SW	5.72	Ineffective
H2	Residential	Feed hopper 1		414	N	6.50	Ineffective
H3	Residential (Town)	Feed hopper 1		630	ENE	13.6	Ineffective
H4	Residential	Storage bag 2		795	SSW	3.61	Ineffective
H5	Residential	Feed hopper 1		860	N	6.50	Ineffective
H6	Residential	Storage bag 2		1,010	S	3.94	Ineffective
H7	Primary School	Feed hopper 1		570	NNE	9.94	Ineffective
H8	Leisure	Separator		430	ESE	5.99	Ineffective
H9	Leisure	Storage bag 2		425	S	3.94	Ineffective
H10	Leisure	Feed hopper 1		675	N	6.50	Ineffective
H11	Leisure	Clamp		707	NW	2.99	Ineffective
H12	Leisure	Separator		1,030	ESE	5.99	Ineffective
H13	Leisure	Storage bag 1		987	W	3.93	Ineffective
H14	Leisure	Separator		1,090	E	9.78	Ineffective
H15	Industrial	Separator		260	SE	4.52	Moderately effective
H16	Industrial	Clamp		530	WNW	2.93	Ineffective
H17	Industrial	Chicken shed		960	NNW	4.18	Ineffective
H18	Commercial / Industrial	Feed hopper 3		585	E	9.78	Ineffective
H19	Commercial	Feed hopper 1		535	N	6.50	Ineffective
H20	Commercial	Feed hopper 1		630	N	6.50	Ineffective
H21	Allotments	Feed hopper 1		655	NNE	9.94	Ineffective



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H22	Footpath	Separator	240	SE	4.52	Moderately effective
H23	Footpath	Feed hopper 1	225	NE	6.50	Moderately effective
H24	Footpath	Clamp	365	W	3.93	Moderately effective
H25	Industrial	Separator	190	SE	4.52	Moderately effective

Risk of odour exposure (impact)

- 4.149 IAQM (2018) risk assessment criteria has been used to establish that the odour exposure risk as a result of the proposed operations at the AD plant, is considered to be 'Negligible' at all locations, with the exception of a 'Low Risk' of odour exposure at receptor H15 Aggregate Industries, and receptor locations H22, H23, H24 that represent footpaths to the northwest, south and east of the Site respectively.

Determination of likely odour effect of the Proposed Development

- 4.150 Following IAQM (2018) guidance, the estimated odour effect (impact) of the proposed development has been determined for all receptor locations.
- 4.151 As shown in Table 4-18 the potential impact is determined to be 'Negligible' at all locations. Overall, the potential odour impact associated with the operation of the development are therefore considered to be 'not significant'.

Table 4-18 Summary of the likely odour effects at existing sensitive receptors in the locale of the AD Plant

Receptor	Overall source odour potential	Pathway effectiveness	Odour exposure risk	Receptor sensitivity	Likely effect	odour
H1	Medium	Ineffective	Negligible	High	Negligible effect	
H2	Medium	Ineffective	Negligible	High	Negligible effect	
H3	Medium	Ineffective	Negligible	High	Negligible effect	
H4	Medium	Ineffective	Negligible	High	Negligible effect	
H5	Medium	Ineffective	Negligible	High	Negligible effect	
H6	Medium	Ineffective	Negligible	High	Negligible effect	
H7	Medium	Ineffective	Negligible	High	Negligible effect	
H8	Medium	Ineffective	Negligible	Medium	Negligible effect	
H9	Medium	Ineffective	Negligible	Medium	Negligible effect	
H10	Medium	Ineffective	Negligible	Medium	Negligible effect	
H11	Medium	Ineffective	Negligible	Medium	Negligible effect	
H12	Medium	Ineffective	Negligible	High	Negligible effect	
H13	Medium	Ineffective	Negligible	Medium	Negligible effect	
H14	Medium	Ineffective	Negligible	Medium	Negligible effect	
H15	Medium	Moderately effective	Low	Medium	Negligible effect	
H16	Medium	Ineffective	Negligible	Medium	Negligible effect	
H17	Medium	Ineffective	Negligible	Low	Negligible effect	
H18	Medium	Ineffective	Negligible	Medium	Negligible effect	
H19	Medium	Ineffective	Negligible	Medium	Negligible effect	
H20	Medium	Ineffective	Negligible	Medium	Negligible effect	
H21	Medium	Ineffective	Negligible	Medium	Negligible effect	
H22	Medium	Moderately effective	Low	Low	Negligible effect	

Receptor	Overall source odour potential	Pathway effectiveness	Odour exposure risk	Receptor sensitivity	Likely effect	odour
H23	Medium	Moderately effective	Low	Low	Negligible effect	
H24	Medium	Moderately effective	Low	Low	Negligible effect	
H25	Medium	Moderately effective	Low	Low	Negligible effect	

Bioaerosols

- 4.152 There are two potential receptors located within 250m of the proposed development, although neither are considered to represent locations of relevant exposure.
- 4.153 Receptor H25, representative of the South Cerney automated Telephone Exchange is located 187m from the nearest potential source of bioaerosols at the proposed development (the digestate Separator Building). However, it is expected that personnel would not be required on-site at the automatic Telephone Exchange except infrequently for maintenance.
- 4.154 The distance between the nearest area of the Aggregate Industries external storage yard is greater than 250m (approximately 260m) to the nearest potential source of bioaerosols at the Site (the digestate Separator Building). Furthermore, any potential exposure at this location would be transient.
- 4.155 It is therefore considered that further evaluation of bioaerosols impact at these locations is not required.

Other emissions to air

- 4.156 The sensitivity of the modelled impacts to three parameters have been investigated, including the year of meteorological data, building effects and terrain effects. For each of the models runs the maximum value at the relevant receptors (human or ecological) for each pollutant-statistic combination was calculated.
- 4.157 The predicted concentrations from dispersion modelling are presented in terms of the maximum predicted impact for each pollutant at a human receptor, that is, the impact at the worst-case receptor.
- 4.158 Two operating scenarios have been considered namely, a more realistic (factored) operating scenario of the plant in the determination of long-term impacts, and for the determination of short-term impacts, only the worst-case operating scenario is assessed. The realistic scenario remains conservative in the assumption that all combustion plant, with the exception of the emergency flare, will be operating continuously.

Long-term impacts

- 4.159 The maximum long-term concentrations for each AQAL, across all receptors and all meteorological years, and the worst of with/ without buildings and with/without terrain are presented.
- 4.160 The predicted concentrations, with and without background concentrations, have been compared with the AQAL. Long-term AQALs are not applicable at the workplaces and recreational locations where the public are unlikely to spend long periods of time.

Annual mean nitrogen dioxide (NO₂)

- 4.161 As shown in Table 4-19 in accordance with IAQM criteria, the magnitude of change would be regarded as negligible. The long-term impacts at all receptors from the Proposed Development can therefore be regarded as not significant.

Table 4-19 Results, long-term AQAL

Pollutant	AQAL (µg/m ³)	PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	Receptor	Predicted Impact
Worst-case scenario							
NO ₂	40	0.77	1.92%	10.7	27%	H3	Negligible
PM ₁₀	40	0.04	0.09%	13.5	34%	H3	Negligible
PM _{2.5}	20	0.04	0.18%	8.69	43%	H3	Negligible
PM _{2.5}	10	0.04	0.18%	8.69	87%	H3	Negligible
Benzene	5	0.27	5.47%	0.46	9.1%	H3	Negligible
NH ₃	180	0.07	0.04%	2.37	1.3%	H1	Negligible
H ₂ S	140	0.001	0.001%	0.001	0.001%	H3	Negligible
Notes: Data on each row is for one receptor, the receptor at which the percentage of PC/AQAL is greatest							

Short-term impacts

- 4.162 Table 4-20 shows the comparison of predicted short-term impacts, from 15 minutes to 24 hours. The predicted concentrations have been compared with the AQALs in accordance with IAQM (2017) guidance and, where applicable, compared with the available headroom and in accordance with EA/Defra AERA (2023) guidance.
- 4.163 The prediction of short-term impacts is conservative in several respects:
- Results at the receptors were calculated as the maximum value at each receptor from 15 model runs.

- It assumes combustion plant will operate at full load, continuously all year. However operational profiles will vary according to peak demand, and it is unlikely that the emergency flare and CHP would ever operate simultaneously.
- Assuming the emissions will be at the ELVs for the CHP and emergency flare
- It has been assumed that benzene is 10% of the emitted TVOC but this is an upper bound and the benzene may be a lower percentage.

Table 4-20 Results, short-term AQAL

Pollutant	Statistic	AQAL ($\mu\text{g}/\text{m}^3$)	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	Headroom ($\mu\text{g}/\text{m}^3$)	PC/Headroom (%)	PEC/AQAL (%)	Receptor	Predicted Impact
NO ₂	99.79 th 1h	200	20.3	10%	180	11%	20%	H25	Negligible
PM ₁₀	90.41 st 24h	50	0.12	0.2%	23.1	0.5%	54%	H2	Negligible
SO ₂	99.9 th 15min	266	19.4	7.3%	261	7.4%	9.0%	H22	Negligible
SO ₂	99.73 rd 1h	350	12.1	3.5%	345	3.5%	4.7%	H22	Negligible
SO ₂	99.18 th 24h	125	0.99	0.8%	119	0.8%	5.4%	H3	Negligible
CO	Max daily 8h*	10000	178	1.8%	9794	1.8%	3.8%	H22	Negligible
Benzene	24h average	30	0.27	0.9%	29.6	0.9%	2.1%	H3	Negligible
NH ₃	1h average	2500	37.5	1.5%	2495	1.5%	1.7%	H25	Negligible
H ₂ S	24h average	150	0.001	0.001%	150	0.001%	0.001%	H3	Negligible

Notes: *Maximum daily 8h running. Data on each row is for one receptor, the receptor at which the percentage of PC/AQAL is greatest

4.164 As shown in Table 4-20 in accordance with IAQM (2017) criteria and EA/Defra AERA (2023) guidance criteria, the predicted impact would be regarded as 'Negligible'. The short-term impacts at all receptors from the proposed development can therefore be regarded as not significant.

Impact Assessment of Air Quality on Ecological Receptors

- 4.165 In this section the highest results are presented, that is, the impacts at the worst-case receptor across all meteorological years, and the worst of with and without buildings.
- 4.166 Considering the nationally designated sites, SSSIs and SACs, Table 4-21 and Table 4-22 show the maximum long-term and short-term concentrations respectively, with and without background concentrations, compared to the AQAL. Table 4-23 and 4-24 show the corresponding information for locally designated sites (LNRs, NNRs, LWS, AW).
- 4.167 Again, a worst-case operating scenario has been considered in the determination of short-term impacts, namely, the continuous (unfactored) operation of the proposed development. However, for the determination of long-term impacts the assessment also remains conservative in assuming continuous operation of the CHPs and boilers.

Long-term impacts

Annual mean NO_x and SO₂

- 4.168 For internationally and nationally designated sites, where sensitive habitats or features are identified and Critical Levels (CLes) have been set, concentrations are not predicted to exceed 1% threshold screening value set out in EA/Defra AERA (2023) guidance and/or IAQM (2020) guidance for the discrete locations modelled (Table 4-21).
- 4.169 Therefore, the impact of NO_x, NH₃ and SO₂ concentrations at the nationally designated sites may therefore be regarded as not significant.
- 4.170 At locally designated sites there are no predicted exceedances (100%) of the lower Cle (Table 4-23). In accordance with EA/ Defra AERA (2023) guidance the long-term impact of concentrations at the local conservation sites is regarded as not significant.

Short-term impacts

- 4.171 The respective maximum predicted short-term NO_x PCs do not exceed 10% of the short-term threshold screening values at the SACs or SSSIs (Table 4-22).
- 4.172 For local sites, the maximum short-term NO_x PCs do not exceed the EA/Defra AERA (2023) guidance short-term threshold screening value, that is, 100% of the relevant standard (Table 4-24).
- 4.173 Therefore, the short-term impact of NO_x concentrations at the national and local conservation sites is regarded as not significant.

Annual mean nutrient nitrogen deposition

- 4.174 Table 4-25 shows the maximum predicted NDep and the percentage PC of the relevant critical load (CLO).
- 4.175 For SACs and SSSIs considered within the study, the maximum PCs are less than 1% of the respective CLOs.



- 4.176 For local conservation sites, the maximum NDep PC are predicted to be less than 100% of the CLo (Table 4-25). On this basis, the potential for these sites to be unduly impacted by rates of nutrient nitrogen deposition as a result of the proposed development is regarded as unlikely and the predicted impact not significant.

Annual mean acid deposition

- 4.177 Table 4-26 shows that the maximum rates of acid deposition are predicted to be less than 1% of the upper Clos at the nationally designated sites.
- 4.178 For local conservation sites, the maximum acid deposition PC is predicted to be less than 100% of the CLo (Table 4-26).
- 4.179 The impact of acid deposition from the proposed development is therefore also regarded as not significant.



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Table 4-21 Results at SAC and SSSI - long-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQAL	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PEC ($\mu\text{g}/\text{m}^3$)	PEC/AQAL (%)	Receptor	Significant?
NO _x	30	Annual	mean	LT	0.06	0.2%	7.76	25.9%	E21 (SAC)	Not significant
SO ₂	20	Annual	mean	LT	0.01	0.1%	0.71	3.6%	E21 (SAC)	Not significant
SO ₂	10	Annual	mean	LT	0.01	0.1%	0.71	7.1%	E21 (SAC)	Not significant
NH ₃	3	Annual	mean	LT	0.003	0.1%	2.40	80.1%	E21 (SAC)	Not significant
NO _x	30	Annual	mean	LT	0.17	0.6%	9.17	30.6%	E6 (SSSI)	Not significant
SO ₂	20	Annual	mean	LT	0.03	0.1%	0.93	4.6%	E6 (SSSI)	Not significant
SO ₂	10	Annual	mean	LT	0.03	0.3%	0.93	9.3%	E6 (SSSI)	Not significant
NH ₃	3	Annual	mean	LT	0.007	0.2%	2.307	76.9%	E6 (SSSI)	Not significant
Notes: - = not applicable. *LT= long-term, ST = short-term. Data on each row is for one receptor, the receptor at which the percentage of PC/AQAL is greatest										



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Table 4-22 Results at SAC and SSSI - short-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQ	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PC/Headroom (%)	Receptor	Significant?
NOx	75	24-hour	100 th percentile	ST	1.50	2.0%	2.6%	E20 (SAC)	Not significant
NOx	200	24-hour	mean	ST	2.46	1.2%	1.4%	E23 (SAC)	Not significant
NOx	75	24-hour	100 th percentile	ST	2.53	3.4%	4.3%	E19 (SSSI)	Not significant
NOx	200	24-hour	mean	ST	2.46	1.2%	1.4%	E23 (SSSI)	Not significant
Notes: *LT= long-term, ST = short-term. Data on each row is for one receptor, the receptor at which the percentage of PC/AQAL is greatest									



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Table 4-23 Results at NNR, LNR, LWS and AW - long-term AQAL

Pollutant	AQAL (µg/m3)	Averaging time	Statistic	LT or ST AQAL	PC (µg/m3)	PC/AQAL (%)	PEC (µg/m3)	PEC/AQAL (%)	Receptor
NO _x	30	Annual	mean	LT	2.87	9.6%	12.8	43%	E27 (LWS)
SO ₂	20	Annual	mean	LT	0.51	2.5%	1.20	6.0%	E27 (LWS)
SO ₂	10	Annual	mean	LT	0.51	5.1%	1.20	12%	E27 (LWS)
NH ₃	1	Annual	mean	LT	0.15	15%	2.45	245%	E26 (LWS)
NH ₃	3	Annual	mean	LT	0.15	5%	2.45	82%	E26 (LWS)

Notes: *LT= long-term, ST = short-term. Data on each row is for one receptor, the receptor at which the percentage of PC/AQAL is greatest

Table 4-24 Results at NNR, LNR, LWS and AW - short-term AQAL

Pollutant	AQAL (µg/m3)	Averaging time	Statistic	LT or ST AQAL	PC (µg/m3)	PC/AQAL (%)	PC/Headroom (%)	Receptor
NO _x	75	24-hour	100 th percentile	ST	31.4	42%	56.9%	E27 (LWS)
NO _x	200	24-hour	mean	ST	2.87	1.4%	1.6%	E27 (LWS)



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Table 4-25 Worst-case nitrogen deposition

Receptor	PC (kg/ha/y)	CLomin (ka/ha/y)	CLomax (ka/ha/y)	PC/CLomin (%)	PC/CLomax (%)	PEDR/CLomin (%)	PEDR/CLomax (%)	Receptor
SAC	0.02	20	30	0.12%	0.08%	101%	67%	E21 (SAC)
SSSI	0.05	20	30	0.26%	0.18%	96%	64%	E6 (SSSI)
AW/ LWS	1.65	10	20	16.5%	8.23%	359%	180%	E26 (LWS)
Notes: data on each row is for one receptor, the receptor at which the percentage of PC/CLmin is greatest								

Table 4-26 Worst-case acid deposition

Receptor	PC	PC/CLo (%)	Background/CLo (%)	PEDR/CLo (%)	Receptor
SAC with respect to C _{max}	0.0029	0.06%	34.7%	34.7%	E21 (SAC)
SSSI with respect to C _{max}	0.0069	0.2%	35.0%	35.2%	E6 (SSSI)
AW, LWS with respect to C _{max}	0.2315	2.1%	24.6%	26.7%	E26 (LWS)
Notes: Data on each row is for one receptor, the receptor at which the percentage of PC/CLo is greatest					

Mitigation Measures

Construction Dust

- 4.180 Recommended mitigation techniques as set out in IAQM guidance to reduce the potential for dust soiling and health impacts during the construction phase of the Proposed Development for a low-risk site are outlined in Table 4-27.
- 4.181 These measures will inform the Construction Environment Management Plan (CEMP) for the site. All construction activities will be planned such that the requirements of the CEMP are taken into account and relevant mitigation measures will be implemented prior to works commencing, as required.

Table 4-27 Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Communications	The name and contact details of person(s) accountable for air quality and dust issues will be displayed on the site boundary.
	Display the Construction Manager and/or regional office contact information.
Monitoring	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills if within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit.
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.

Site Application	Mitigation Measures
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the Local Authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
Waste Management	No burning of waste materials.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Implement a wheel washing system to prevent mud being deposited on the highway. Before leaving the site vehicles will be inspected for heavy deposits on their wheels if present the deposit's will be removed manually or with a power washer. Measures may include the installation of rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

Conclusion

- 4.182 The assessment considers the potential for air quality impacts of the proposed development to adversely impact upon human health and ecological conservation sites within the locale.
- 4.183 The evaluation, based on qualitative risk-based approach in addition to detailed atmospheric dispersion modelling assessed the magnitude and significance of any potential short and long-term effects in relation to the air quality standards set in legislation and relevant evaluation criteria provided in guidance.
- 4.184 In terms of sensitive receptors that may be affected by traffic impacts associated with the construction and operation of the Development, the level of the predicted increase in annual average daily traffic (AADT) flows of light and heavy-duty vehicles associated with construction or operation of the Development were not considered to require further detailed assessment in accordance with DMRB and IAQM criteria. The potential impact is therefore determined to be insignificant.
- 4.185 For sensitive receptors affected by construction dust impacts from the development, the potential for dust soiling/ health impacts impact as a result of deposition from the construction phase is considered to be not significant.
- 4.186 There are no sensitive receptor locations within relevant EA screening distance criteria of potential on-site bioaerosol sources associated with the proposed development. Therefore, impacts are likely to be insignificant and a site-specific bioaerosol risk assessment is not required.
- 4.187 Based on a qualitative risk assessment approach, the potential for odour impact at nearby receptor locations was determined to be not significant.
- 4.188 For the modelling of long-term impacts, and as a conservative approach, the assessment has considered the continuous operation of combustion plant at the proposed development, with the exception of the emergency flare.
- 4.189 The magnitude of change, even when considering the conservative assessment approach, is determined to be negligible for long-term impacts of NO₂, TVOCs (as 10% benzene), H₂S, NH₃, and particulate matter (PM₁₀ and PM_{2.5}). In accordance with IAQM (2017) criteria, the predicted long-term impacts at receptors are therefore determined to be not significant.
- 4.190 The maximum the short-term NO₂, CO, TVOC, SO₂, NH₃, H₂S, and particulate matter (PM₁₀) impacts are predicted to be not significant in accordance with IAQM (2017) guidance and/or EA/Defra AERA (2023) guidance.
- 4.191 As the relevant standards are not predicted to be exceeded at locations where the either the long-term or short-term objective applies, the potential for impacts from the operation of the proposed development at human receptor locations are considered to be not significant.
- 4.192 Within 10km of the Site there are 18 Site of Special Scientific Interest, including two corresponding areas also designated SACs, and several local wildlife sites. Long-term air quality impacts of predicted concentrations at both the nationally and locally designated ecological conservation areas are determined as not significant.



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- 4.193 The potential for impact on nationally and locally designated conservation sites as a result of nitrogen and acid deposition from the process is considered to be not significant.
- 4.194 It is considered that predicted air quality impacts are found not to be a constraint on the construction or operation of the proposed development.



Air Quality Impact Assessment for a Proposed Anaerobic Digestion Plant at Ashton Keynes, Wiltshire

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Abbreviations

AAD	Ambient Air Quality Directive (2008/50/EC)
AADT	Annual average daily traffic
AcidDep	Acid deposition
AD	Anaerobic Digester
AQAL	Air quality assessment level
AQAP	Air Quality Action Plan
AQIA	Air Quality and Odour Impact Assessment
AQMA	Air Quality Management Area
AQS	Air quality standards
AQSR	Air Quality Standards Regulations 2010
AW	Ancient Woodland
BAT	Best Available Techniques
CDC	Cotswold District Council
CHP	Combined heat and power engine
CLe	Critical level (concentration)
CLo	Critical load (deposition)
CO	Carbon monoxide
CO ₂	Carbon dioxide
Defra	Department for the Environment, Food and Rural Affairs
DM	Dry matter
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EAL	Environmental Assessment Level
EC	European Commission
ELV	Emission limit value
EPUK	Environmental Protection UK
EU	European Union
GCC	Gloucestershire County Council
GCER	Gloucestershire Centre for Environmental Records
GUU	Gas upgrading unit
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
kWe	Kilowatt electrical output
kWthi	Kilowatt thermal input
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
LNR	Local Nature Reserve
LWS	Local Wildlife Sites
mAOD	Metres Above Ordnance Datum
MCP	Medium Combustion Plant

MCPD	Medium Combustion Plant Directive
n/a	Not applicable
N	Nitrogen
NDep	Nutrient nitrogen deposition
NE	Natural England
NECD	National Emissions Ceiling Directive
NGR	National Grid Reference
NH ₃	Ammonia
NMVOCS	Non-methane volatile organic compounds
NNR	National Nature Reserve
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
O ₂	Oxygen
PC	Process Contribution
PEC	Predicted environmental concentration
PH	Priority Habitat
PM _{2.5}	Particulate matter, with aerodynamic diameter less than 2.5µm (very fine)
PM ₁₀	Particulate matter, with aerodynamic diameter less than 10µm (fine)
RIGS	Regionally Important Geological and Geomorphological Site
SAC	Special Area of Conservation
SBC	Swindon Borough Council
SO ₂	Sulphur dioxide
SPA	Special Protection Area
SPD	Supplementary Planning Document
SSBRA	Site specific bioaerosol risk assessment
TPA	Tonnes per annum
TVOC	Total gaseous and vaporous organic substances, expressed as total organic carbon
VOC	Volatile organic compounds
WCC	Wiltshire County Council
WSBRC	Wiltshire and Swindon Biodiversity Records Centre

Executive Summary

Earthcare Technical Ltd (ETL) have evaluated the potential air quality impact associated with the proposed development of an Anaerobic Digestion Facility which will produce biogas to then be upgraded to biomethane for injection to the National Grid, carbon dioxide for use in industrial processes and biofertiliser to be used on local farms.

The assessment considers the potential for the construction and operational phases of the Proposed Development to adversely impact upon human health and sensitive ecological receptors within the locale.

The evaluation, based on detailed atmospheric dispersion modelling using ADMS 5.2.2, assesses the magnitude and significance of any potential short and long-term effects in relation to the air quality standards set in legislation and relevant evaluation criteria provided in guidance.

In terms of receptors that may be affected by traffic impacts, associated with the construction and operation of the Proposed Development, the level of the predicted increase in annual average daily traffic (AADT) flows of both light and heavy-duty vehicles associated with construction and/or operation of the Proposed Development were not considered to require further detailed assessment in accordance with DMRB and IAQM criteria and therefore the potential for impact may be regarded as insignificant.

The potential for dust soiling/ health impacts as a result of construction phase activities at sensitive human receptor locations is **not significant**. Construction phase dust impacts at sensitive ecological areas are also considered to be **not significant**.

For the operational phase of the Proposed Development the potential for odour, dust and bioaerosol impacts at nearby sensitive locations during were risk assessed and, in accordance with relevant criteria, determined to be **not significant**.

Other emissions to air during the operational phase of the development have been assessed using dispersion modelling. For modelled locations selected as representative of relevant human exposure, the long- and short-term predicted impacts at receptors has been determined to be **not significant**.

Air quality impacts of predicted concentrations at conservation areas during the operational phase are determined to be **not significant**. Predicted rates of nutrient nitrogen and acid deposition on sensitive conservation areas as a result of the proposal are considered unlikely to unduly impact these sites.

It is considered that the predicted impact of emissions to air are found not to be a constraint on the construction and operation of the Proposed Development.

1. Introduction

Earthcare Technical Ltd (ETL) has been commissioned by Acorn Bioenergy Limited (Acorn), to prepare an Air Quality Impact Assessment (AQIA) for the development of an Anaerobic Digestion (AD) plant (the 'Proposed Development'), on agricultural land off Ashton Road, southeast of South Cerney, Ashton Keynes, Wiltshire, GL7 6DD, hereafter referred to as 'the Site'.

This AQIA forms a Technical Appendix to Air Quality Chapter 4 of the Environmental Statement (ES).

1.1 Proposed Development

Figure 1 shows the Site location and the proposed Site layout is provided in Appendix A. Full details of the Proposed Development are provided in the accompanying ES.

The Site will process approximately 91,000 tonnes per annum (TPA) of crops and agricultural waste (manures) and will produce 67,568 TPA of separated liquid digestate, which would be removed from the on-site storage bags via tankers, and 55,283 TPA of separated fibre digestate, which would be temporarily stored within the on-site Separator Building and, typically removed from site daily. Both the liquid and fibre digestate will be transported to destination farms for use as biofertiliser to confer agricultural benefit.

The Proposed Development would generate biogas, a proportion of which will be combusted in an on-site combined heat and power engine (CHP) to produce heat and electricity to power the AD plant equipment and the remainder upgraded to remove contaminants, such as volatile organic compounds (VOCs), before producing biomethane and carbon dioxide (CO₂). Biomethane will be removed from the site by tanker to a central facility where it will be injected into the National Grid. CO₂ produced as result of the upgrading process will be cleaned, liquefied and transported by road to end users.

The AD plant would have two CHPs; a 635kWe (1,580kWthi) fuelled by biogas and a 1,506kWe (3,508kWthi) CHP fuelled by natural gas. The CHPs are classified as 'new' under the Medium Combustion Plant (MCP) Directive.

1.2 Assessment Objective and Scope

This AQIA assesses the potential impact of emissions to air during the construction and operational phase of the Proposed Development, on air quality at relevant receptor locations within the locale of the application site, by comparison to relevant guidelines for the protection of human health and conservation areas.

The assessment of air quality impacts and determination of mitigation measures is informed through:

- A review of relevant legislation, policy, and guidance.
- A review of baseline conditions at the Site.
- A review of emissions data supplied by example or proposed technology providers.
- Assessment of construction phase impacts including qualitative assessment of traffic and dust.
- Assessment of operational phase impacts including qualitative assessment of traffic, dust, bioaerosols and odour impacts. Atmospheric dispersion modelling of combustion and

ammonia (NH₃) emissions is also undertaken, from which the dry deposition to sensitive conservation sites has been calculated. Combustion sources have been modelled at the specified Emissions Limit Values (ELVs) if ELVs exist for the sources and from data for similar plant at other sites if there are no ELVs.

- An evaluation of the significance of any potential short and long-term effects in relation to air quality assessment levels (AQAL) (i.e., limits, targets, objectives, and assessment levels) set in legislation and evaluation criteria provided in relevant guidance.

While ELVs and the air quality standards for ecological receptors are specified for NO_x, standards for human health are for nitrogen dioxide (NO₂) which is emitted as a by-product of combustion and is formed (and consumed) in chemical reactions including NO_x and other species.

There are no AQALs for total volatile organic compounds (TVOC) but there is an AQAL for benzene which is one of the VOCs emitted. TVOC has been modelled as 10% benzene.¹

The pollutants considered in this AQIA are, therefore:

- Oxides of nitrogen (NO_x)
- Nitrogen dioxide (NO₂)
- Sulphur dioxide (SO₂)
- Carbon monoxide (CO)
- Total Volatile Organic Compounds (TVOCs)
- Benzene
- Hydrogen sulphide (H₂S)
- Ammonia (NH₃)
- Dust/ particulate matter (PM₁₀, PM_{2.5})
- Odour
- Bioaerosols

Predicted depositions have been compared with critical loads (CLOs) for nutrient nitrogen deposition (NDep) and acid deposition (AcidDep) at sensitive conservation sites.

This report describes: the process (section 2); relevant legislation, policy and guidance for industrial emissions, ambient air quality and modelling of emissions to air (Section 3); the assessment methodology (Section 4); assessment criteria (Section 4); background concentrations (Section 5); the assessment of impact (Sections 6 and 7), measures for mitigating construction dust impacts (Section 8), before Section 9 concludes.

¹ N R Passant (2002) Speciation of UK emissions of non-methane volatile organic compounds. Reference: AEAT/ENV/R/0545 Issue 1

2. Process Description

The indicative proposed site layout is shown in Appendix A.

The Site will process approximately 91,000 tonnes per annum (TPA) of crops and agricultural waste (manures) including silage, crop residues, FYM and poultry litter. Feedstock material will be transferred daily using a farm trailer and/or front loader and fed directly into the solids feeders during two loading phases. Material agitated during the transfer process and following placement will be a source of odour, odorous manures will be covered by at least 50cm of silage to abate odour. Slurry will be pumped within a sealed system into the digesters.

Run-off from the apron between the feeders will drain to the Dirty Water/ Leachate Tank. Dirty water will be added to the solid feedstocks in the feeder once macerated, where they will be mixed and pumped to the digesters.

The process will produce 'whole digestate' that will be pumped to a screw press separator enclosed within a building, where it will be separated into a digestate liquor and solid (fibre) fraction. The solid digestate would be temporarily stored within the Separator Building prior to transfer off-site. The fibre will be removed once daily, and therefore subject to short storage times on-site prior to removal to destination field heaps and/or for land application. The loading activity will be a source of odour.

Following separation, separated liquid digestate (liquor) would be temporarily stored on-site in two storage bags and removed via tankers. Both the liquid and fibre digestate will be transported to destination farms for use as biofertiliser to confer agricultural benefit.

Biogas from the digestion process is stored in the storage domes above the digesters. The digester tanks will each have a pressure relief valve (PRV) as a safety measure to emit biogas or take in air if there is an over-pressure or under-pressure event respectively. PRVs will not operate during normal operation, only as an emergency contingency and so releases of biogas and associated odour from the PRVs would be short-lived.

The emergency flare will be a safety feature and will only burn biogas under abnormal operating conditions. The flare will only operate for a limited number of hours per year as production of biogas can be controlled by controlling the digester feed rates. Biogas combustion in the flare will emit pollutants (principally TVOC, NO_x and CO) at height, although emissions from the combustion of biogas are not expected to be a source of odour.

The AD operation will incorporate a desulphurisation process. The injection of low levels of oxygen and the addition of ferric chloride will reduce H₂S levels within the digester tanks. Biogas will be subject to further H₂S removal in a series of filters before it is combusted or upgraded.

A proportion of the biogas generated will be combusted in an on-site combined heat and power engine (CHP) to produce heat and electricity to power the AD plant equipment. The AD plant would have two CHPs; a 635kWe (1,580kWthi) fuelled by biogas and a 1,506kWe (3,508kWthi) CHP fuelled by natural gas.

Biomethane will be removed from the site by tanker to a central facility where it will be injected into the National grid. CO₂ produced as result of the upgrading process will be cleaned, liquefied and transported by road to end users.

2.1 Feedstock and digestate tonnages

Table 1 shows the tonnages of each feedstock to be processed at the Site.

The AD process will give rise to 67,568 TPA of liquid digestate and approximately 55,283 TPA of solid digestate which will be stored and then exported from Site. The amount produced has been calculated based on digester dry matter (DM) and assuming total nitrogen of 9kg per tonne (kg total N/t) derived from the feedstocks which will be diluted by water/liquid used within the process.

Table 1 Feedstock Materials

Feedstock (Inputs)	Category	Mass required (TPA)	Dry matter (%)
Rye Silage	Energy Crop/Product	15,000	35.0%
Maize Silage	Energy Crop/Product	12,000	32.0%
Grass Silage	Energy Crop/Product	14,000	35.0%
Straw	Residue/Waste	20,000	86.9%
Cattle slurry	Livestock waste	5,000	6.0%
Farmyard Manure ('FYM')	Livestock waste	10,000	25.0%
Poultry Litter	Livestock waste	15,000	40.0%
Total		91,000	

Note: Data supplied by Acorn Bioenergy Ltd

2.2 Emissions to air

Table 2 lists the sources of emissions to air that have been considered in this impact assessment and those sources not included.

The gas upgrade unit (GUU) exhaust has not been included in the evaluation as the GUU will have gas capture and therefore the only emissions will be small amounts of carbon dioxide (CO₂) periodically released during depressurisation. The emergency generator has been excluded as it will operate for a limited number of hours, typically less than 50 hours per year.

Table 2 Sources of emissions to air

Source	Emissions	Operation profile
CHP 1, Jenbacher 321, 635kWe, fuelled by biogas (65% CH ₄ /35% CO ₂)	SO ₂ , TVOC, NO _x , CO	8,500 hours per year, 100% load (modelled as continuous)
CHP 2, Jenbacher 420, 1,560kWe, fuelled by natural gas (100% CH ₄)	TVOC, NO _x , CO	8,500 hours per year, 100% load (modelled as continuous)
2No. Boilers, Veissmann Vitoplex 200, 560kWtho, both fuelled by biogas (65% CH ₄ /35% CO ₂)	SO ₂ , NO _x , CO	50% load for approx. 4 months. Will only operate for maintenance outside of this period e.g., if CHP offline. (Modelled as continuous, 100% load).
Centriair exhaust from Chicken manure shed	Odour, NH ₃	Continuous
Emergency gas flare	TVOC, NO _x , CO	Safety feature used <10% of year. Modelled as continuous to determine short-term impacts. Long-term impacts based on 10% annual operation.
Three feed hoppers	Odour, NH ₃	Feed 37 minutes/hour. Modelled as continuous - 24h/day, 365 days/year.
Three dirty water tanks with vents	Odour, NH ₃	Continuous. Unabated emission from vents.
Separator Building	Odour, NH ₃	Continuous
Two 10,000m ³ digestate storage bags with 2No. vents per bag	Odour, NH ₃	Continuous
Tanker offtake for liquid digestate	Odour, NH ₃	Long-term impacts based on off-take profile between: 08:00-17:00; 5.5 days/week; Feb-Sept. Modelled as continuous for short-term impacts.
Sources not included		
Emergency generator	SO ₂ , TVOC, NO _x , CO	Negligible long-term impact, likely to operate less than 50 hours/year.
Three slurry tanks	Odour, NH ₃	Emissions will be vented into a closed system.
Straw building	Odour	Negligible emissions of odour
Straw bunker	Odour	Negligible emissions of odour
Silage clamps	Odour	Negligible to low emissions of odour during storage
Digestate tanks	Odour, TVOC, NH ₃	Closed system, zero emissions except during pressure relief valve (PRV) operation (not used during normal operation)

3. Policy, Legislation and Guidance

3.1 National Planning Policy

National Planning Policy Framework (2021)

The National Planning Policy Framework was updated on 20 July 2021 and sets out the government's planning policies for England and how these are expected to be applied.

Under Section 15; Conserving and Enhancing the Natural Environment, Paragraph 174 states: *"Planning policies and decisions should contribute to and enhance the natural and local environment by: e) 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"*.

Paragraph 186 further states: *"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 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."*

3.2 Local Planning Policy

The Proposed Development site is situated within the administrative boundary of Wiltshire County Council (WCC) and is within close proximity to Gloucestershire County Council (GCC) administrative area. Local policies relevant to the AQIA are outlined in Table 3.

Table 3 Local planning policies

Policy/ Guidance	Policy wording
Development Plan	
Wiltshire Core Strategy (Adopted 2015)	Core Policy 50 (CP50) Biodiversity and Geodiversity: Policy CP50, paragraph 6.72 states: <i>"For the purposes of evaluation in ecological impact assessment, the value of undesignated habitats and species should be measured against published selection criteria where possible. However, statutory protection will only ever apply to those sites which have been formally notified by Natural England."</i> CP50 also states that: "Any development that would have an adverse effect on the integrity of a European nature conservation site will not be in accordance with the Core Strategy... Development proposals affecting local sites must make a reasonable contribution to their favourable management in the long-term."
	Core Policy CP55 Air Quality: With reference to CP55, paragraph 6.116 of the strategy states that: "Development which could potentially impact upon Natura 2000 sites through contributions to aerial deposition e.g., industrial process within 10km of a SAC, will require an assessment of the likely impacts in accordance with published

Policy/ Guidance	Policy wording
	guidance. Where mitigation is required this may be delivered through a local emissions strategy.” CP55 states: <i>“Development proposals, which by virtue of their scale, nature or location are likely to exacerbate existing areas of poor air quality, will need to demonstrate that measures can be taken to effectively mitigate emission levels in order to protect public health, environmental quality and amenity. Mitigation measures should demonstrate how they will make a positive contribution to the aims of the Air Quality Strategy for Wiltshire and where relevant, the Wiltshire Air Quality Action Plan. Mitigation may include:</i> <i>i. landscaping, bunding or separation to increase distance from highways and junctions</i> <i>ii. possible traffic management or highway improvements to be agreed with the local authority</i> <i>iii. abatement technology and incorporating site layout/separation and other conditions in site planning</i> <i>iv. traffic routing, site management, site layout and phasing</i> <i>v. where appropriate, contributions will be sought toward the mitigation of the impact a development may have on levels of air pollutants.”</i>
Saved Policies of North Wiltshire Local Plan 2011 (Adopted June 2006)	Policy NE18 Noise and Pollution states that: <i>“Development will only be permitted where it would not generate, or itself be subject to, harm upon public health or cause pollution to the environment by the emission of excessive noise, light intrusion, smoke, fumes, other forms of air pollution, heat, radiation, effluent or vibration.”</i> Paragraph 6.51 of the Local Plan states that <i>“to minimise the air pollution from roads and buildings, development proposals will be expected to incorporate suitable landscaping to help remove air borne pollutants and particulates.”</i>
Air Quality Action Plan for Wiltshire June 2015	The Air Quality Action Plan (AQAP) for Wiltshire² was produced in June 2015 by Wiltshire County Council in response to declaration of Air Quality Management Areas (AQMAs) within the county, of which there are eight. The AQAP sets out the strategic and locally generated actions that will be implemented to improve air quality and work towards meeting the air quality objectives. The primary source of pollutants in these AQMAs are due to vehicle emissions.
Air Quality Strategy for Wiltshire 2019 - 2024	The strategy³ sets out the approach to improving air quality across the county. The strategy provides a link between wider council strategies, such as the Wiltshire Core Strategy, and the evidence base in order to improve air quality.

² Air Quality Action Plan for Wiltshire June 2015 (2015)
(<https://cms.wiltshire.gov.uk/documents/s149491/WCO23AirQualityActionPlanforWiltshire.pdf>)

³ Air Quality Strategy for Wiltshire 2019 – 2024
(<https://cms.wiltshire.gov.uk/documents/s170639/Appendix%201%20Wiltshire%20Air%20Quality%20Strategy%20Document.pdf>)

3.3 European and UK Air Quality Legislation

Whilst the UK has left the European Union (EU), the EU Withdrawal Act 2018⁴ brought all EU laws and regulations, made while the UK was a member of the EU, into UK law by creating a new category of UK law: EU retained law. Therefore, the EU Directives described in this section still apply in the UK.

- **Directive 2008/50/EC:**⁵ Ambient Air Quality Directive (AAD) and 4th Daughter Directive contain Limit Values and Target Values with which the UK must comply. The Directive also sets limit and target values including air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5}).
- **The UK Air Quality Strategy (2007):** Part IV of the Environment Act 1995⁶ establishes the framework for managing air quality to achieve compliance with air quality objectives and for local air quality management (LAQM). The most recent framework was set out in The UK Air Quality Strategy (2007) and is the framework for the UK Government to implement the Ambient Air Directive (AAD) Limit Values i.e., the limit values, target values and objectives (AQOs) for key pollutants to achieve improvements in air quality and for the prevention and/or reduction of harmful effects on human health or on ecosystems.⁷ The AQOs for the protection of human health and ecosystems applicable to the scope of this assessment are presented in Table 5.
- **Air Quality Standards Regulations (2010)**⁸ and subsequent amendments including the **Air Quality standards (Amendment) Regulations 2016**.⁹ The regulations set legally binding limits for concentrations in outdoor air of key pollutants that impact public health: SO₂, NO_x, particulate matter (as PM₁₀ and PM_{2.5}), lead, benzene, carbon monoxide (CO) and ozone.¹⁰ The Air Quality Standards Regulations relevant to this assessment are listed in Table 5.
- The AQALs for human health apply in non-occupational near ground level outdoor locations where a person might reasonably be expected to be exposed over the relevant averaging period.¹¹
- For substances not specified in the regulations, Environmental Assessment Levels (EALs) as provided in Defra/Environment Agency (EA) Air Emissions Risk Assessment Guidance¹² ('AERA') are included and are also presented in Table 5.

⁴ UK Legislation, European Union (Withdrawal) Act 2018, [26th June 2018]

⁵ DIRECTIVE 2008/50/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 May 2008 on ambient air quality and cleaner air for Europe comment on amendment

⁶ Environment Act 1995, 1995 Chapter 25, Part IV Air Quality

⁷ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 1. July 2007.

⁸ Statutory Instrument: 2010 No. 1001, ENVIRONMENTAL PROTECTION, The Air Quality (Standards) Regulations 2010 comment on amendment

⁹ The Air Quality Standards (Amendment) Regulations 2016, Statutory Instrument 2016 No, 1184, Made 6th December 2016

¹⁰ Defra UK Air Quality Policy Context (<https://uk-air.defra.gov.uk/air-pollution/uk-eu-policy-context>)

¹¹ Department for Environment, Food & Rural Affairs and the Devolved Authorities, Local Air Quality Management Technical Guidance (TG22), August 2022

¹² Environment Agency. Air emissions risk assessment for your environmental permit (<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>). Last updated 22 March 2023.

- **National Emissions Ceiling Directive:** Sets emission reduction commitments for pollutants including NH₃. The NECD entered into force on 31 December 2016 and is transposed into UK law as National Emissions Ceiling Regulations 2018.¹³ It replaced earlier legislation, and it sets 2020 and 2030 emission reduction commitments for anthropogenic emissions of five main air pollutants: SO₂, NO_x, non-methane volatile organic compounds (NMVOCs), NH₃ and PM_{2.5}.
- **Medium Combustion Plant Directive:** The ELVs set in the Medium Combustion Plant Directive (MCPD) apply from 20th December 2018 for plants with a rated thermal input equal to or greater than 1MWth and less than 50MWth.¹⁴ The MCPD regulates emissions of SO₂, NO_x and dust to air and requires monitoring of CO emissions. The relevant ELVs for the proposed new engines using biogas and natural gas during the operational phase, used in this assessment, are those defined in Part 2 of Annex II of the MCPD and are given in Table 7 of this report.
- **Environmental Targets (Fine Particulate Matter) (England) Regulations 2023:** The UK Environment Act 2021¹⁵ aims to deliver improvements in air quality and brings into force the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023¹⁶ which sets the two PM_{2.5} targets into law and contains provisions on how the targets will be monitored and assessed. One target is an annual mean concentration and the second is for population exposure reduction.

Odour

- New development should be designed to ensure that it does not cause environmental pollution, which may then be controlled and regulated by other agencies. The control of pollution is governed by the Environmental Protection Act (1990) and related legislation. Part III, Section 79 of the Act defines several statutory 'nuisances' including: 'Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance.'¹⁷
- Adverse impacts of odour may include dis-amenity, 'annoyance', 'nuisance' and possibly complaints.¹⁸ The distinction between the terms is defined by the Institute of Air Quality Management (IAQM) as: annoyance – the adverse effect occurring from immediate exposure; nuisance – the adverse effect caused cumulatively, by repeated events of annoyance. Currently, there are no statutory standards for assessing odour annoyance nor nuisance in the UK.

¹³ Statutory Instrument 2018 No. 129 Environmental Protection. The National Emission Ceilings Regulations 2018 (<https://www.legislation.gov.uk/ukxi/2018/129/made>)

¹⁴ Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2193>)

¹⁵ The Environment Act 2021 (<https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>)

¹⁶ Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

¹⁷ Environmental Protection Act 1990 (<https://www.legislation.gov.uk/ukpga/1990/43/section/79/1991-02-01?wrap=true&timeline=true>)

¹⁸ Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1, Institute of Air Quality Management, London. (www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf)

Dust

- Statutory standards exist for concentrations of suspended particulate matter (PM₁₀, PM_{2.5}), set under The Air Quality Standards Regulations 2010 (Table 5) for the protection of human health. However, there are no UK or European statutory standards that identify when deposited dust causes annoyance or dis-amenity.
- The provisions of the environmental permit will regulate and control odour and dust emissions from the Proposed Development in accordance with Best Available Techniques (BAT). The permit will require that there will be no fugitive emissions of dust beyond the Site boundary and limits would be set for any controlled releases of particulate matter.

Legislation for the Protection of Ecosystems

- **The Wildlife and Countryside Act 1981:** The Wildlife and Countryside Act¹⁹ is the primary legislation which protects animals, plants and habitats in the UK and established the protection of Sites of Special Scientific Interest (SSSIs).
- **Habitats Directive:** The Directive seeks to ensure the protection of natural habitats, wild fauna, and flora. It introduced the Natura 2000 ecological network of protected areas that includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs, for the protection of birds)²⁰
- **The Conservation of Habitats and Species Regulations 2017:** These regulations transpose the Habitats Directive into law in England and Wales and provides the legal basis in the UK for candidate SACs (which are designated under the Habitats Directive) and for designated SACs and SPAs.²¹ The regulations describe how '*a competent authority must decide if a plan or project proposal that affects a European site can go ahead*'²² by undertaking a Habitats Regulations Assessment (HRA). It must test whether the Proposed Development, a 'project' in HRA terms, could significantly harm the designated features of a European site.

3.4 Planning Guidance for Air Quality Assessment

The approach of the AQIA follows that of assessment criteria provided in relevant guidance outlined in Table 4.

¹⁹ The Wildlife and Countryside Act 1981

²⁰ The Habitats Directive. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Eur-Lex. Accessed March 2023.

²¹ Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') as amended

²² Habitats regulations assessments: protecting a European site, Available at: <https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site> [Accessed April 2022]

Table 4 Relevant guidance

Document	Scope
Traffic Exhaust Emissions	
Design Manual for Roads and Bridges (DMRB) (DMRB, 2007)	The Design Manual for Roads and Bridges (DMRB)²³ methodology provides the following criteria for the determination of potential air quality impacts as a result of vehicle exhaust emissions: • Daily Annual Average Daily Traffic (AADT) flows change by 1,000 or more; • Daily Heavy Duty Vehicle (HDV) AADT flows change by 200 or more; • Daily average speed changes by 10km/hr or more; or • Peak hour speed changes by 20km/hr or more. Should changes be lower than these criteria, then the DMRB considers air quality impacts associated with a scheme to be negligible and no further assessment is required.
Environmental Protection UK (EPUK)/ Institute of Air Quality Management (2017)	Provides indicative criteria whereby an air quality assessment may be required. For traffic these are:²⁴ • Cause a significant change in Light Duty Vehicle (LDV = cars and small vans <3.5t gross vehicle weight) traffic flows on local roads with relevant receptors i.e., a change of LDV flows of more than 500 Annual Average Daily Traffic (AADT) outside an AQMA; and • Cause a significant change in Heavy Duty Vehicle (HDV = goods vehicles + buses >3.5t gross vehicle weight) flows on local roads with relevant receptors i.e., a change of HDV flows of more than 100 AADT outside an AQMA. IAQM guidance recommends that the criteria provided are precautionary and should be treated as indicative.
Dust	
IAQM Guidance on the assessment of dust from demolition and construction (2016)	IAQM guidance²⁵ establishes a framework for assessment based on key activities, that reflect their different potential impacts, that include demolition, earthworks, construction and track out for determining the significance of dust impacts. The guidance sets out appropriate mitigation to reduce the significance of potential impacts.
IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning	Institute of Air Quality Management (IAQM) guidance provides a framework to assist in the undertaking of dust assessments for mineral sites. The initial step is a simple distance-based screening process. Where more detailed assessment is required, a basic assessment framework is presented which employs the Source-Pathway-Receptor approach to evaluate the risk of dust impacts and effects.

²³ Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, Highways Agency, May 2007

²⁴ Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London. (<http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>)

²⁵ IAQM (2014) IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Document	Scope
	The guidance applies to the operational phases of minerals developments and draws on elements of earlier IAQM construction guidance (detailed above). Whilst mineral sites are comparable to some construction sites and waste operations they are typically much larger in scale and this is reflected in source strength and pathway distances detailed within this guidance. The underlying Source-Pathway-Receptor approach, applicable to a wide range of applications, is adopted herein for the assessment of operational dust impacts along with professional judgement given the relatively much smaller dust source strength of the proposed AD plant.
Odour	
EA H4 Odour Management guidance (2011)	EA H4 Odour Management guidance ²⁶ provides guiding principles on odour regulation, assessment, and control but is strictly applicable to sites permitted by the EA. H4 sets out criteria identifying the type of odours which may be classified as ‘most offensive’ e.g., processes involving septic effluent or sludge, ‘moderately offensive’ e.g., intensive livestock rearing, and ‘less offensive’ e.g., a brewery. The guidance outlines the factors that will determine the degree of odour pollution, as summarised by the FIDOR acronym.
IAQM Odour guidance (2018)	IAQM Guidance on the assessment of odour for planning ²⁷ provides a framework for the assessment of odour impacts for planning applications and significance criteria against which the significance of the impacts can be assessed. The assessment presented herein follows the IAQM guideline criteria that is discussed in more detail in Section 4.
Bioaerosols	
EA Position Statement	The position statement ²⁸ issued by the EA in respect of potential health effects from bioaerosols, confirms a 250m separation distance criterion between composting facilities and sensitive receptors.
EA Technical Guidance Note M9	M9 guidance ²⁹ confirms a 250m separation distance criterion between biological waste treatment facilities and sensitive receptors i.e., the nearest place where people are likely to be for prolonged periods and applies to dwellings (including gardens) and to workplaces where people are likely to be present for at least 6 hours.

²⁶ Environment Agency (March 2011) Technical Guidance Note H4 - Odour Management. How to comply with your environmental permit

²⁷ Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1, Institute of Air Quality Management, London.

²⁸ Environment Agency (2011) Composting and potential health effects from bioaerosols: our interim guidance for permit applicants Position Statement 031 Version 1.0 1st November 2010

²⁹ Environment Agency (2018) Technical Guidance Note (Monitoring) M9 Environmental monitoring of bioaerosols at regulated facilities Version 2
(https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730226/M9_Environmental_monitoring_of_bioaerosols_at_regulated_facilities.pdf)

Document	Scope
EA Biological waste treatment: appropriate measures for permitted facilities	EA Appropriate Measures guidance applies to aerobic and anaerobic processes including AD. Where a treatment process is located within 250m of a sensitive receptor then the EA require a site specific bioaerosol risk assessment (SSBRA). ³⁰
Protection of Ecosystems	
IAQM guide to the assessment of air quality impacts on designated nature conservation sites (2020)	The guidance ³¹ provides outline principles to also assist in the assessment of air quality impact on European, national, and local designated sites. The guidance recommends that, the 1% and other percentage screening criteria should not be used rigidly and not to a numerical precision greater than that of the criteria themselves. Notably, and as further stated within the guidance, the <i>"1% screening criterion is not a threshold of harm and exceeding this threshold does not, of itself, imply damage to a habitat."</i>
Technical guidance on detailed modelling	
Technical Guidance AQTAG06	This document (AQTAG06) ³² provides guidance on how to carry out a quantitative assessment including guidance on calculating deposition for emissions to air in order to fulfil the requirements of the Habitats Regulations. This method and deposition velocities have been used in this assessment, as detailed in Appendix D.
LAQM Technical Guidance (LAQM.TG22)	The Local Air Quality Management (LAQM) Technical Guidance (LAQM.TG22) ³³ provides guidance on monitoring and assessing air quality, action planning and reporting. LAQM.TG22 outlines the objectives that apply to locations of relevant public exposure, as follows: • Annual mean: All locations where members of the public might be regularly exposed (i.e., building façades of residential properties, schools, hospitals, care homes etc.). • 24-hour mean, and 8-hour mean: All locations where the annual mean objective would apply, together with hotels and gardens of residential properties. • 1-hour mean: All locations where the annual mean and 24- and 8-hour mean objectives apply. Kerbside sites (e.g., pavements of busy shopping streets). Any outdoor locations where members of the public might reasonably expect to spend one hour or longer. • 15-minute mean: All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.

³⁰ Environment Agency (September 2022) Biological waste treatment: appropriate measures for permitted facilities (<https://www.gov.uk/guidance/biological-waste-treatment-appropriate-measures-for-permitted-facilities>)

³¹ Holman et al (2020). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.1, Institute of Air Quality Management, London.

³² Environment Agency (April 2014) AQTAG06 - Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.

³³ Defra (August 2022) Local Air Quality Management Technical Guidance (TG22) (<https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf>)

Document	Scope
	The objectives are not relevant to places of work or other locations where members of the public do not have regular access. However, for completeness, adjacent industrial/ commercial premises within the locale of the Site have been considered in the assessment of short-term impacts.
Significance Criteria	
Environmental Protection UK (EPUK)/ Institute of Air Quality Management (2017)	Provides direction and criteria against which the significance of the air quality impacts can be assessed. As stated in Paragraph 4.17 of the guidance, the importance of air quality issues in determining planning applications depends on: • ‘The severity of impacts on air quality; • The air quality in the area surrounding the development; • The likely use of the development (relating to length of exposure at the location); and • Positive benefits provided through other material considerations.’ This approach is set out in Section 4.
Defra/ EA Air emissions risk assessment for your environmental permit guidance (‘AERA’)	The webpage ³⁴ provides Defra and EA guidance provides screening criteria for quantifying the environmental impacts of emissions to air when compared with the relevant Ambient Air Directive (AAD) Target Values, UK Air Quality Strategy Objectives (AQOs) and Environmental Assessment Levels (EALs). Those relevant to the assessment presented herein are set out in Table 5.

3.5 Assessment Criteria

Air Quality Assessment Levels (AQALs)

The impact of emissions to air is assessed against the following relevant environmental standards, as set in European and national legislation, policy, and guidance, as described in Section 3, that may apply to human or ecological receptors:

- Air Quality Standards Regulations 2010 Limit Values
- Air Quality Standards Regulations 2010 Target Values
- UK air quality strategy objectives
- EALs
- Critical levels and critical loads for protected conservation areas

These AQALs, that include Limit Values, Objectives and EALS for human health are collectively referred to as Air Quality Assessment Levels (AQALs) herein and are presented in Table 5 and Table 6.

³⁴ Environment Agency (March 2023) Air emissions risk assessment for your environmental permit (<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>)

Table 5 Air Quality Assessment Levels (AQALs)

Substance	Emission period	Limit (average)	Standard	Exceedances ¹
Ammonia	1-hour	2,500µg/m ³	EAL	None
Ammonia	Annual	180µg/m ³	EAL	None
Benzene	24-hour	30µg/m ³	EAL	None
Benzene	Annual	5µg/m ³	Limit Value	None
Carbon monoxide	8 hour running average across a 24-hour period	10,000µg/m ³	Limit Value	None
Hydrogen sulphide	24-hour	150µg/m ³	EAL	None
Hydrogen sulphide	Annual	140µg/m ³	EAL	None
Nitrogen dioxide	1-hour	200µg/m ³	Limit Value	Up to 18 1-hour periods
Nitrogen dioxide	Annual	40µg/m ³	Limit Value	None
Particulates (PM ₁₀)	24-hour	50µg/m ³	Limit Value	Up to 35 times a year
Particulates (PM ₁₀)	Annual	40µg/m ³	Limit Value	None
Particulates (PM _{2.5})	Annual	20µg/m ³	Limit Value	None
Particulates (PM _{2.5})	Annual	10µg/m ³	Target to be met by 2040 ⁽²⁾	None
Sulphur dioxide	15 minutes	266µg/m ³	UK Air Quality Strategy Objective	Up to 35 15-minute periods
Sulphur dioxide	1-hour	350µg/m ³	Limit Value	Up to 24 1-hour periods
Sulphur dioxide	24-hour	125µg/m ³	Limit Value	Up to 3 24-hour periods
Notes: Air Quality Standards Regulations 2010 Limit Values, UK Air Quality Strategy Objectives and EALS for human health. Standards taken from https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit ¹ Number of times a year the limit may be exceeded. ² Environmental Targets (Fine Particulate Matter) (England) Regulations 2023, as required by UK Environment Act 2021.				

Environmental Standards for Conservation Sites

Table 6 sets out the environmental standards, AQALs, for the pollutants relevant to this assessment for ecological receptors. The AQALs in Table 6 that are limits for concentrations of pollutants in air, are referred to as 'Critical Levels' (CLes) There are no short-term AQALs for the impact of SO₂ or NH₃ on ecological receptors.

Table 6 Environmental standards for protected conservation areas

Substance	Target	Standard	Emission period
Ammonia ¹	1µg/m ³ where lichens or bryophytes (including mosses, landworts and hornworts) are present. The value specified in the Woodland Trust guidance of 3µg/m ³ where they are not present.	Limit Value	Annual
SO ₂	10µg/m ³ where lichens or bryophytes are present 20µg/m ³ where they are not present	Target Value ¹ and EAL	Annual
NOx (expressed as nitrogen dioxide (NO ₂)) ¹	30µg/m ³	Limit Value	Annual
NOx (expressed as NO ₂)	75µg/m ³	EAL	Daily
NOx (expressed as NO ₂) ²	200µg/m ³	EAL	Daily
Nutrient nitrogen deposition (NDep)	Depends on location, use www.apis.ac.uk to find values	EAL	Annual
Acidity deposition (AcidDep)	Depends on location, use www.apis.ac.uk to find values	EAL	Annual
Notes: Information from https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit . ¹ 20µg/m ³ is a Limit Value for nature or conservation sites. ² Only for detailed assessments where the ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10µg/m ³ .			

CLes may vary depending on the sensitive features of the habitat. AQALs that are limits for deposition for nutrient nitrogen (NDep) and deposition of acid species (Acid Dep), are referred to as 'Critical Loads' (CLOs) which also vary spatially and with habitat. Values of the CLOs for the most sensitive species/habitat evaluated are presented in Appendix D.

For the following conservation sites within 10km of the Proposed development there are no sensitive habitats or species listed in APIS and therefore, presently, no CLes or CLOs:

- Cotswold Water Park (CWP) SSSI – principal habitat is that of standing water for which no sensitive habitat or features are defined
- Kemble Railway Cuttings geological SSSI
- Local Wildlife Sites (LWS) including: River Churn LWS - designated for mammal interest, and Regionally Important Geological Sites (RIGS) including South Cerney Railway Cutting LWS/ RIGS and Shorncote Quarry RIGS.

The Critical Load Screening Function provided by APIS applies the appropriate CLOs for significance tests (for planning / EIA) based on acid deposition as a proportion of the Maximum Critical Load Function (keq/ha/yr).

4. Methodology

4.1 Introduction

The methodology comprised four parts which are described in more detail in Sections 4.2 to 4.8:

1. Baseline conditions assessment at the Site and the surrounding area: background concentration and deposition (Section 4.2, Section 5).
2. Screening potential impacts against a threshold to determine whether detailed modelling is required.
3. Modelling of impacts: assessment of the likely changes in concentration and deposition due emissions from the sources listed in Table 2 and operation of the plant under normal operating conditions. The assessment was undertaken using the ADMS 5 dispersion model (Section 4.7) and model parameters (Section 4.7 and Appendix D).
4. Assessment of significance: Section 4.8 describes the tests of significance for planning and permitting.

If the impacts are significant then further investigation would be required.

4.2 Baseline conditions

The baseline assessment has used the latest available monitored and modelled data to establish the current state of the environment. The following sources of information have been used in preparing the baseline assessment which is presented in Section 5:

- Swindon Borough Council (SBC) 2021 Air Quality Annual Status Report (ASR) 2021:³⁵ identification of AQMAs, monitoring sites and monitoring data.
- MAGIC website³⁶: identification of Ramsar sites, SACs, SPAs, SSSIs, AWs, NNRs and LNRs
- Defra Background Mapping data for local authorities³⁷: mapped concentrations on a 1km² basis. The mapped concentrations of NO_x, NO₂ are derived from maps based on 2018 data projected to 2019, for comparison with relevant monitored data. Concentrations of other pollutants are only available for earlier years: SO₂ and CO (2001); Benzene (2010) and can be projected to 2019 using factors supplied by Defra.
- APIS, UK Air Pollution Information System website³⁸: mapped background deposition values of NO_x at each receptor, site-specific critical loads, and background deposition rates at SPAs and SSSIs, and gridded habitat-specific critical loads and background deposition rates at LWS and LNRs.
- Data request to Wiltshire and Swindon Biodiversity Records Centre (WSBRC)³⁹ and Gloucestershire Centre for Environmental Records:⁴⁰ identification of LWS.

³⁵ Swindon Borough Council (SBC) 2021 Air Quality Annual Status Report (ASR) 2021 (https://www.swindon.gov.uk/downloads/file/7782/air_quality_annual_status_report_2021)

³⁶ MAGIC website (<https://magic.defra.gov.uk/MagicMap.aspx>)

³⁷ Defra Background Mapping data for local authorities (<https://uk-air.defra.gov.uk/data/laqm-background-home>)

³⁸ Air Pollution Information System (APIS) (<https://www.apis.ac.uk/>)

³⁹ Wiltshire and Swindon Biodiversity Records Centre (WSBRC) Ecological Data Search Reports (Received 02/11/2022)

⁴⁰ Gloucestershire Centre for Environmental Records (GCER) Ecological Data Search Reports (Received 20/11/2022)

4.3 Vehicle Emissions Assessment

Section 3 outlines the requirement for detailed assessment of potential road vehicle emissions impact during the construction and operational phase, and has been determined in accordance with the following guidance:

- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 (2007), Highways Agency;²³ and
- Land-use Planning and Development Control: Planning for Air Quality. v1.2 (2017), EPUK/IAQM.²⁴

4.4 Construction Dust/ Particulate Matter

The construction phase of the Proposed Development will include earthworks and construction for the development of the AD facility infrastructure.

The potential air quality impacts associated with the construction phase may include:

- Dust/ particulate matter generated from materials handling and transfer and on-site plant and machinery.
- Increased transport emissions (NO_x and PM₁₀) generated by construction-generated vehicle movements.

Activities during the construction phase only are considered to have the potential to give rise to dust generation and particulate matter (PM₁₀) and thus regular and persistent dust 'annoyance', which may affect local amenity and quality of life.

The potential for dust nuisance or 'annoyance' effects is related to emissions of large and fine particles and is usually considered to comprise particles with diameters ranging from 1 to 75µm (microns i.e., thousandths of a millimetre). An assessment of smaller dust particles (particulate matter less than 10µm or 'PM₁₀') is considered for combustion emissions associated with traffic emissions.

The potential for annoyance, is directly related to the existing baseline dust levels, the number and proximity of residential areas to the site, and the exact nature and size of the activities on-site. The degree of actual annoyance would also depend on factors, such as, the rate of dust deposition, and the application of mitigation measures on site.

The amount of dust that might cause annoyance in a particular circumstance is difficult to determine and there are no statutory limits such as those applicable to suspended particulates or gaseous pollutants. A qualitative assessment of the dust generation potential of the operation has been undertaken.

The assessment is based on IAQM guidance on the assessment of the impacts of construction on air quality.⁴¹ The assessment method takes account of construction activities that are divided into categories to reflect their different potential impacts. Those relevant to the assessment include:

⁴¹ Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf.

- Demolition – there will not be any demolition undertaken so that activity has not been considered further.
- Earthworks – the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – an activity involved in the provision of a new structure; and
- Trackout – the transport of dust and dirt from the site onto the public road network. This arises when vehicles leave site with dusty materials or transfer dust and dirt onto the road having travelled over muddy ground on-site.

The risk of dust effects is determined by:

- The scale and nature of the works, which determines the risk of dust arising; and
- The proximity of sensitive receptors.

The detailed assessment is a five-stage process, as summarised in Appendix B.

4.5 Odour

The factors that will determine the degree of odour impact are summarised by the FIDOR acronym²⁶ as follows:

- Frequency of detection (exposure)
- Intensity (strength) of exposure
- Duration of exposure
- Offensiveness - includes its hedonic tone. The scale for hedonic tones typically ranges from +4 (very pleasant odours) to -4 (extremely unpleasant/ foul odours). Neutral odours score 0.
- Receptor sensitivity (type of land use, expectation, and tolerance of receptor)

The risk assessment presented herein follows the framework set out in IAQM guidance on the assessment of odour for planning. A qualitative risk-based odour assessment has been undertaken that evaluates the potential odour impacts associated with the operational phase of the Proposed Development. The scope of the evaluation includes:

- A review of the proposed infrastructure at the site of the proposed AD Plant.
- An assessment of the likely magnitude and nature of odour emissions that may be generated.
- Completion of a qualitative risk-based odour assessment to assess the risk of off-site odour impact occurring during the normal operation of the Proposed Development.

The IAQM method follows the Source-Pathway-Receptor (S-P-R) approach to establishing whether an odour impact could occur. The approach considers the source emission and the pathway that could lead to odour exposure (both a function of FIDO), and the sensitivity of receptors exposed to the odour. As outlined in the guidance, the S-P-R concept is based on: **Effect ≈ Dose x Response**.

Where:

- Dose (impact) is determined by F-I-D-O
- Response is determined by receptor sensitivity
- The effect is the result of the changes on a receptor

Consistent with IAQM approach, the assessment establishes the 'source odour potential' (source magnitude) at the Proposed Development; the 'pathway effectiveness' in terms of proximity and prevailing wind direction; and potential odour effects based on the nature of receptors in the locale of the Proposed Development.

The framework set out by IAQM used to estimate the risk of impact occurring and likely magnitude of the impact is outlined in Appendix C.

4.6 Bioaerosols

Section 2 outlines EA Appropriate Measures that require an site specific bioaerosol risk assessment (SSBRA) where a treatment process is located within 250m of a sensitive receptor.³⁰ The approach to SSBRA follows the Source-Pathway-Receptor (S-P-R) principle to establish whether an impact could occur.

In accordance with standard rules environmental permits, in circumstances where a receptor is not located within 250 metres of the proposed operation and there will be no further treatment such as composting digestate fibre in the open taking place, then it is considered the potential impacts would have insignificant effects and no further risk assessment is required.

4.7 Modelling of air quality impacts

Model

The dispersion model used to predict ambient concentrations due to the stack emissions was ADMS 5 (version 5.2.2.0). The model is termed a 'new generation' model and is commonly used in the UK for permit applications to the EA and for quantitative assessments submitted as part of a planning application.

It requires as input: data on the source of emissions and the mass emission rates of each pollutant (Table 7 to Table 11), meteorological data and associated parameters, buildings data, terrain data, and receptor locations. Full details of the meteorological, buildings and receptor data are described in Appendix D.

The outputs calculated by the model are the air concentrations of pollutants from the sources modelled for the relevant averaging times and statistics. The contribution from the modelled sources on the Site to air concentration and to deposition rate are referred to the Process Contribution (PC), which is then compared with the relevant standard (Table 5 and Table 6). When background concentration or deposition rate are added to the PC, the totals are referred to as Predicted Environmental Concentration (PEC) and Predicted Environmental Deposition Rate (PEDR) respectively, which are also compared with the relevant standard.

From air concentration of NO₂ and NH₃ the deposition rate of nitrogen can be calculated and the acid deposition due to nitrogen; from the air concentration of SO₂ the contribution of sulphur to acid deposition is calculated.

Model options

For sources which will have ELVs set in the permit, emissions have been modelled at the ELVs. In the absence of ELVs, monitoring data from comparable plant at other sites or manufacturer specified values have been used. Assuming the continuous operation of these sources provides a pessimistic prediction of impacts as no account has been taken of planned outages for maintenance.

The topography falls from west to east across the Site, with a change in elevation of approximately 10m. To account for the topographical changes across the site, two models have been run for each of the five years of meteorological data (2017-2021). The two models cover three combinations of model option scenarios:

Model A (adjusted building and emission source heights (relative to CHP1 at approx. 91.5mAOD))

- Flat terrain, no buildings
- Flat terrain, with buildings

Model B (no adjustment to building and emission source heights)

- With terrain (hills) and with buildings

Results at the receptors were calculated as the maximum value at each receptor from these 15 model runs and are therefore worst-case values across all five years and considering flat terrain, buildings, and hills.

Sources and emissions

The source geometry, parameters, ELVs, design emission limits and calculated emissions are given in Table 7 for point sources (CHP 1, CHP 2, and the emergency flare), Table 8 for point sources (2No. back-up boilers, Centriair odour abatement exhaust stack), Table 9 (4No. digestate storage bag vents, 3No. dirty water tank vents, 1No. off-take tanker vent), Table 10 (3No. feed hoppers) and Table 11 (Separator Building). Source locations are shown in Figure 2 and Figure 3.

Table 7 CHP and flare emission parameters

Parameter	Units	CHP 1 ¹	CHP 2 ²	Flare ³
Location	NGR (X,Y) m	404072, 196070	404072, 196065	404105, 196029
Fuel	-	Biogas	Natural gas	Biogas only
Electrical output	kWe	635	1,499	n/a
Thermal input	kWthi	1,580	3,508	16,200
Stack height ⁴	m	7	7	8.7
Internal diameter at exit	m	0.25	0.45	2.37
Volume flow rate (dry)	Nm ³ /s	0.66	1.57	5.51
Volume flow rate (wet)	Am ³ /s	1.51	5.03	63.5
Velocity	m/s	30.8	31.6	14.4
Temperature	°C	180	411	1,000
Exit concentration SO ₂	mg/Nm ³	107 (ELV, 5% O ₂)	-	-
Exit concentration TVOC	mg/Nm ³	1,000 (ELV, 5% O ₂)	1,000 (5% O ₂)	10
Exit concentration NOx	mg/Nm ³	500 (ELV, 5% O ₂)	250 (ELV, 5% O ₂)	150
Exit concentration CO	mg/Nm ³	1,400 (ELV, 5% O ₂)	1,400 (5% O ₂)	50
Emission rate SO ₂	g/s	0.070	-	-
Emission rate TVOC	g/s	0.655	1.566	0.055 [0.006] ⁵
Emission rate NOx	g/s	0.328	0.391	0.827 [0.083] ⁵
Emission rate CO	g/s	0.917	2.192	0.276 [0.028] ⁵
Notes: ¹ Used data for JMS 312 GS-BL, 365kWe, fuelled by biogas. ELVs are the MCP Directive values for new plant (Annex II, Part 2, Table 2). ² Used data for a JMS 420 GS-BL, 1,499kWe, fuelled by natural gas. ELVs are the MCP Directive values for new plant (Annex II, Part 2, Table 2). ³ Uniflare data for a UF10 2,500 high temperature enclosed flare stack, 500 -2,500Nm ³ /hr biogas. ⁴ Above local terrain height ⁵ Emission rate factored for annual operating hours				

Table 8 Boiler and Centriair odour abatement stack and emission parameters

Parameter	Units	Boiler 1 ¹	Boiler 2 ¹	Centriair odour abatement stack ²
Location	NGR (X,Y) m	404106, 196043	404106, 196043	403979, 196235
Fuel	-	Biogas	Biogas	n/a
Thermal output	kWtho	560	560	n/a
Thermal input	kWthi	609	609	n/a
Stack height ⁴	m	7	7	8
Internal diameter at stack exit	m	0.25	0.25	0.5
Volume flow rate (dry)	Nm ³ /s	0.15	0.15	n/a
Volume flow rate (wet)	Am ³ /s	0.31	0.31	2.99
Velocity	m/s	6.25	6.25	15.2
Temperature	°C	180	180	10-35, modelled as 'Ambient'
Exit concentration SO ₂	mg/Nm ³	100 (ELV, 3% O ₂)	100 (ELV, 3% O ₂)	-
Exit concentration NO _x	mg/Nm ³	200 (ELV, 3% O ₂)	200 (ELV, 3% O ₂)	-
Exit concentration CO	mg/Nm ³	50 (3% O ₂) ²	50 (3% O ₂) ²	-
Exit concentration PM ₁₀	mg/Nm ³	-	-	5.0
Exit concentration NH ₃	mg/Nm ³	-	-	0.177 (0.25 ppm)
Exit concentration H ₂ S	mg/Nm ³	-	-	0.142 (0.1 ppm)
Emission rate SO ₂	g/s	0.015	0.015	-
Emission rate NO _x	g/s	0.029	0.029	-
Emission rate CO	g/s	0.007	0.007	-
Exit concentration PM ₁₀	g/s	-	-	0.015
Emission rate NH ₃	g/s	-	-	0.001
Emission rate H ₂ S	g/s	-	-	0.0004
Notes: ¹ Boiler, 560kW, Veissmann Vitoplex 200. ELVs for SO ₂ and NO _x are the MCP Directive values for new plant (Annex II, Part 2, Table 1). ² CO exit concentration is a conservative assumption, informed by monitoring data from a similar boilers at other AD plants. ³ CentriAir odour abatement system emission concentrations provided by potential supplier. Volume flow rate based on three air changes per hour for the Chicken manure shed. ⁴ Above local terrain height				

The same emission factors have been used to estimate the emissions from the tanker vents at the digestate off-take point, assuming each tanker has a volume of 27m³ and the emissions are those for a half-filled tanker, which is the average volume of digestate in the tanker during the filling process. It has been assumed digestate will be removed from Site from February to September inclusive, 5.5 days/week and between 8am and 5pm. Filling one tanker will take approximately 20 minutes, but emissions have been spread across one hour, as the ADMS model uses hourly emissions. A time varying file has been used so that the tanker vents are modelled as emitting only during the hours/days of the week/months when tankers will be present.

Emissions from the Separator Building have been modelled as a volume source the size of the building (to the centroid of the roof). Emission rates of NH₃ have been calculated based on the quantity of solid digestate stored within the building at any one time as approximately two days' worth (303 tonnes), which is a conservative estimate as digestate will be removed daily, using the EMEP/EEA emission

factors and assuming an 80% reduction in emissions as the separation and fibre storage will be undertaken within a building.

Table 9 Digestate storage bags, dirty water tank vents and tanker vents

Parameter	Units	Digestate storage lagoon vent	Dirty water tank vent ¹	Tanker vent ^{2,3}
Number of vents exhausting to air	-	2 (per lagoon)	1 (per tank)	1 per tanker
Capacity for calculation	m ³	10,000 digestate liquor (9,000kg N)	n/a	27
Storage bag/tanker surface area (emitting area)	m ²	n/a	50	n/a
Location of vent(s)	NGR (X,Y)	See Figure 2	See Figure 2	See Figure 2
Vent release height ⁵	m	0.5	8.2	3
Internal diameter at stack exit	m	0.1	0.1	0.1
Volume flow rate	Am ³ /s	-	-	0.0225
Velocity	m/s	0.1 (assumed)	0.1 (assumed)	2.86
Temperature	°C	Ambient	Ambient	Ambient
Area emission rate NH ₃	kg NH ₃ /m ² /yr	n/a	0.28	n/a
Emission rate NH ₃	g/s	0.0019 (per vent) ⁴	8.9 x 10 ⁻⁵ (per vent)	5.0 x10 ⁻⁸
Notes: ¹ Assumes the dirty water is 20% slurry, so the emission is 20% of that for pig slurry (SCAIL model) held in a rigid store. ² Calculated from the tanker volume of 27m ³ and a filling time of 20 minutes. ³ Emission rate during filling. The total NH ₃ g/yr have been kept constant and assumed to be even spread across the hours when emissions can occur: 9 h/day, 5.5 days/week, February to September inclusive. Calculated based on 95% emissions reduction. ⁵ Above local terrain height				

The feed hoppers will operate almost continuously feeding the digesters for 37 minutes per hour. NH₃ will be emitted from poultry manure and FYM when loaded into the hoppers. Emissions have been assumed to occur continuously as some manure may remain in feeders even when they are not operating, and as the ADMS model is based on hourly average emission values. The volume source modelled is 0.5m deep at the top of the feed hopper.

Table 10 Volume sources: Feed hoppers

Parameter	Units	Solids feeders (per feeder)
Capacity	m ³	120
Depth, width, length	Each in m	0.5, 3, 14.2
Emitting surface area	m ²	42.6
Emission mid-height	m	3.0
Poultry manure	t/h (per feeder)	0.571
FYM	t/h (per feeder)	0.381
Poultry manure – emission rate	kg/t/yr	2.38 ¹
FYM – emission rate	kg/t/yr	1.49 ¹
Emission rate NH ₃	g/m ³ /s	1.60 x10 ⁻⁵
Notes: ¹ Environment Agency's standard ammonia emissions for intensive farming https://www.gov.uk/guidance/intensive-farming-risk-assessment-for-your-environmental-permit#ammonia-emissions		

Table 11 Volume sources: Separator building

Parameter	Units	Separator building
Height to eaves	m	6.8 ¹
Height to apex	m	7.8
Height to centroid of roof	m	7.20
Length	m	18
Width	m	15
Volume of building	m ³	1,926
Solid digestate produced	TPA	55,283
Typical storage volume (any one time)	t	303
Emissions of NH ₃ from digestate present	kg NH ₃ /yr	72.52
Reduction factor for enclosed building	-	80%
Reduced emissions of NH ₃	gNH ₃ /m ³ /s	2.4 x10 ⁻⁷
¹ Actual height to eaves 6.7m, adjusted by +0.1m for modelling purposes		

4.8 Significance of Results

Human receptors

IAQM guidance Land-Use Planning & Development Control: Planning for Air Quality (2017) outlines a method to assist with the determination of air quality impacts of planning proposals, to be applied alongside professional judgement.

The IAQM (2017) Land-Use Planning guidance provides a framework for describing impacts based on the change in the concentration from the scheme relative to the environmental standard and the overall concentration including the scheme, that is, the future background concentration plus the process contribution from the scheme. The matrix in Table 12 is intended to be used with annual mean concentrations.

Table 12 Impact descriptors for individual receptors – long term concentrations

Long Term Average Concentration	% Change in Concentration relative to standard			
	1	2 – 5	6 – 10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Notes: From IAQM (2017) Land-use Planning guidance				

The outcome of the assessment procedure represented in Table 12 applies to an individual receptor and not the overall impact; the overall significance is determined alongside professional judgement.

Further, it is intended that the change in concentration relative to the AQAL is rounded to the nearest whole number, such as to ‘not assume a false level of precision’ in terms of the accuracy of the results. Where the overall effect is greater than ‘Slight Adverse’ the effect is likely to be considered as ‘significant’.

IAQM guidance provides additional criteria for the assessment of the impacts of ‘peak’ short-term concentrations, specifically those averaged over a period of 1-hour or less and where exposure from an elevated source at a receptor may be regarded as ‘acute’. Table 12 summarises the impact descriptors. This approach to the assessment of short-term impacts does not include consideration of background concentrations, that is the calculation of PEC is not required. In these circumstances, baseline concentrations and the peak concentrations are not additive.

In determining overall significance of the proposed development, paragraph 6.40 of the IAQM guidance states that: *“In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached*

through the presence of the new source, taking into account the contribution of other prominent local sources.”

Table 13 Impact descriptors for individual receptors – short term concentrations

% Change in Concentration relative to AQAL	Magnitude of change	Severity of impact
<10%	Negligible	Negligible ¹
11 – 20 %	Small	Slight
21 – 50%	Medium	Moderate
>51%	Large	Substantial
Notes: Based on criteria provided in IAQM (2017) Land-use Planning guidance ¹ Adopted from EA threshold criterion of 10% of the short term AQAL, below which an impact is regarded as having an insignificant or ‘negligible’ effect.		

The criteria presented in Table 13 are not applicable to the assessment of short-term impacts averaged over periods longer than 1-hour, for example a 24-hour period, as the wider nature of the plume spread and corresponding receptor exposure is different to that of peak concentrations. Therefore, for these averaging periods criteria set out in EA/Defra AERA (2023) guidance¹⁶ has been followed in determining the significance of results.

The EA/Defra AERA (2023) guidance considers initial screening and then detailed modelling. At the initial screening stage, a PC can be screened out from further assessment if:

- the short-term PC is less than 10% of the short-term environmental standard.

The second stage of screening considers the background concentration as well as the PC. The Predicted Environmental Concentration (PEC) is the sum of the PC and background concentration. A further assessment is not needed if:

- the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration i.e., it is less than 20% of the **headroom**.

If the PC cannot be screened out on that basis, the guidance outlines further steps which may lead to a requirement to carry out a cost-benefit analysis.

Ecological receptors

IAQM (2020) Conservation Sites guidance; ‘A guide to the assessment of air quality impacts on designated nature conservation sites’ follows EA/ Defra permit guidance which states that when there are SPAs, SACs, Ramsar sites and SSSIs (within the relevant screening distance), the emissions can be considered insignificant if:

- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas
- the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas

If these criteria are not met the next stage is to test:

- Whether the long-term PEC is less than 70% of the long-term environmental standard

If the PEC is less, no further assessment is needed. If the PEC does not meet the criterion, or if the short-term PC exceeds the previous screening criteria, detailed modelling is required.

When there are local nature sites within the specified distance, the emissions do not need to be assessed further if:

- the short-term PC is less than 100% of the short-term environmental standard
- the long-term PC is less than 100% of the long-term environmental standard If these criteria are not met, further assessment is required.

Therefore, in accordance with the EA/Defra AERA (2023) approach, further calculation of PEC for local nature sites is not required to support an impact assessment.

Overall Significance

Generally, where the overall effect for a receptor is greater than “slight adverse”, the effect is likely to be considered significant.²⁴ A ‘significant’ effect does not mean that the proposal is unacceptable - further consideration should be given to additional mitigation measures and balanced against benefits of the proposal.

5. Baseline

5.1 Site Description

Figure 1 shows the location of the Site at national grid reference (NGR) SU 04003 96174. The site is located approximately 1.8km north of the village of Ashton Keynes, and falls just within Wiltshire County Council, and is close to the administrative boundary of Gloucestershire County Council.

Land use within the locale is primarily arable agriculture and field boundaries are marked by trees. The Site centre is at an elevation of approximately 96m AOD. Beyond the site, the topography rises to 251m AOD 15km to the northwest of the Site and falls further east (to an elevation of 80m AOD within 1km of the Site).

The wider environs surrounding the Site include the Cotswold Water Park; a complex of inland lakes set across Wiltshire and Gloucestershire. The lakes are clustered in two main groups; with the larger grouping to the west centred on the village of Ashton Keynes.

5.2 AQMA

The proposed Site is not located within or in proximity to an Air Quality Management Area (AQMA). The closest AQMA is 'Kingshill Road' declared on 02/05/2018, by Swindon Borough Council (SBC) approximately 16km to the southeast, declared for annual mean nitrogen dioxide (NO₂).⁴² The nearest AQMA declared by Cotswold District Council (CDC) is at Birdlip, approximately 22.5km northwest of the site declared in 2008 for annual mean NO₂.⁴³

5.3 Human Receptors

Within the locale there are scattered residential clusters; the closest residential receptor that include buildings and gardens associated with the Cotswold Community (residential redevelopment) site, are located 335m to the southwest. The Site is situated 120m north of Aggregate Industries, that provides ready-mix concrete, crushed stone, and gravel. A Trading Estate/ Business Park is situated approximately 526m to the east. Table 51, Appendix D, lists the human receptor locations evaluated.

5.4 Ecological Receptors

The EA/Defra AERA (2023) guidance (which applies to industrial emission sources) identifies a screening distance of 2km for local and nationally important sites (LWS, LNRs, SSSIs) and areas of ancient woodland (AW), and up to 10km or 15 km depending on the size of the emission source for European Sites.

The nearest nationally and EU-designated ecological conservation sites, and the relative distance to the Site are listed in Table 52, Appendix D. There are 18 designated sites within 10km of the Site and their locations shown in Figure 8 and Figure 9. The closest is the Cotswolds Water Park (CWP) Site of Special Scientific Interest (SSSI). The CWP SSSI sits approximately 300m to the west and 300m to the southeast and east of the site. The Site is also within 3km of EU-designated North Meadow and Clattinger Farm Special Area of Conservation (SAC).

⁴²Defra UK Air Kingshill Road, Swindon AQMA (Swindon Borough Council) https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1745

⁴³ Defra UK Air, Air Information resource (https://uk-air.defra.gov.uk/aqma/details?aqma_ref=559) Accessed March 2023.

5.5 Local monitoring of background concentrations

The local authority Annual Status Reports provide information on monitoring carried out in the respective local authorities areas and reports the quality-controlled data.

During 2019 i.e., the latest year for which data are unlikely to be affected by the Coronavirus (COVID-19) pandemic, WCC undertook automatic (continuous) monitoring at four sites and non- automatic (passive) monitoring of NO₂ at 72 sites. The nearest monitoring site is a diffusion tube roadside location 'DT39', 13km to the southwest.

The nearest diffusion tube location monitored by Swindon Borough Council (SBC) is located 10km to the southeast, used for roadside monitoring.

CDC does not operate any automatic monitoring sites. In 2019, CDC operated a network of 16 diffusion tubes for the monitoring of NO₂. The nearest monitoring sites are roadside location diffusion tubes 'NAS34' and 'NAS35', located 3.8km and 4.4km to northwest of the Site respectively. The most recent monitoring data for diffusion tubes within 6km of the Site are presented in Table 14.

At NAS34, a roadside monitoring location on Spratsgate Lane near the junction with Park Way, Cirencester, the annual mean NO₂ for the latest relevant year for which data are available in 2019 was 9.3µg/m³. At roadside monitoring location (NAS35), situated on Berkeley Road junction with Somerford Road, the annual mean NO₂ was 9.9µg/m³. Roadside monitoring location (NAS36) is situated on Somerford Road, 5.3km northwest and is located within the more urban area of Cirencester. The location of diffusion tubes NAS34 and NAS35 could be generally more representative of background concentrations for roadside receptor locations within the locale of the Site considered within the study area.

From the monitoring data available, it can be concluded that NO₂ concentrations in the vicinity of the Site are sufficiently below the annual mean AQAL.

Table 14 Annual mean NO₂ monitoring results (2016 - 2020)

Site ID	NGR X	NGR Y	Type of site	NO ₂ Annual Mean Concentration (µg/m ³) ⁽⁴⁾ ⁽⁵⁾				Distance from site (km)
				2017	2018	2019	2020	
NAS28	403020	202175	Roadside	-	-	29.8	22.1	6.2
NAS29	402305	202519	Roadside	34.8	29.8	29.9	23.8	6.6
NAS30	402783	201946	Kerbside	25.7	22.6	23.4	17.7	6.0
NAS31	402480	201772	Roadside	22.6	20.9	20.6	15.7	5.8
NAS32	402039	201765	Roadside	21	18.1	17.2	13.2	6.0
NAS33	401064	201044	Roadside	24.6	21.8	21.6	16.2	5.7
NAS34	402394	199581	Roadside	9.6	9.5	9.3	7.4	3.8
NAS35	402439	200297	Roadside	9.4	9.4	9.9	7.0	4.4
NAS36	402241	201102	Roadside	17.6	14.5	14.9	11.2	5.3
Notes: / = not available. BG = background.								

5.6 National mapping of concentrations/ Defra modelled background

Defra and the Devolved Government Authorities provide maps of background concentration to assist local authorities in LAQM.²⁹ The pollutants included are, therefore, those for which UK Air Quality Objectives exist. The mapped concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} have been updated regularly and predicted values are available for 2022 (based on a reference year of 2018). Other pollutants have not been updated since calculations were made using a reference year of 2001.

Table 15 shows the Defra background concentrations at each receptor for the year 2019 for comparison with the latest (pre-Covid) year of monitoring data (Table 14). The Defra background NO₂ values, up to 7.68µg/m³, broadly agree with the nearest roadside pre-Covid background monitoring location data (for 2019) measured at roadside locations (9.9µg/m³).

To account for receptor locations situated at roadside locations within the study area, the higher measured NO₂ background value of 9.9µg/m³ for 2019 (Table 14) has been used in the assessment to calculate the PEC and PEDR as a precautionary approach.

Table 15 Defra background mapped 2019 concentrations at each Human receptor⁴⁴

ID	2019 Annual mean background concentration					
	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	Benzene (µg/m ³)	CO (mg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (mg/m ³)
H1	6.36	2.30	0.17	0.10	13.1	8.35
H2	7.68	2.86	0.18	0.10	13.5	8.65
H3	7.68	2.86	0.18	0.10	13.5	8.65
H4	6.36	2.30	0.17	0.10	13.1	8.35
H5	6.77	2.20	0.16	0.10	12.5	8.34
H6	7.64	2.27	0.18	0.10	14.0	9.52
H7	7.68	2.86	0.18	0.10	13.5	8.65
H8	7.64	2.27	0.18	0.10	14.0	9.52
H9	7.64	2.27	0.18	0.10	14.0	9.52
H10	7.68	2.86	0.18	0.10	13.5	8.65
H11	6.30	2.03	0.17	0.10	13.5	8.41
H12	7.01	2.15	0.19	0.10	13.3	8.52
H13	6.22	2.02	0.17	0.10	12.9	8.23
H14	7.59	2.28	0.19	0.10	13.0	8.49
H15	7.64	2.27	0.18	0.10	14.0	9.52
H16	6.30	2.03	0.17	0.10	13.5	8.41
H17	7.15	2.07	0.17	0.10	13.6	8.38
H18	7.68	2.86	0.18	0.10	13.5	8.65
H19	7.68	2.86	0.18	0.10	13.5	8.65
H20	6.30	2.03	0.17	0.10	13.5	8.41
H21	7.68	2.86	0.18	0.10	13.5	8.65
H22	7.64	2.27	0.18	0.10	14.0	9.52
H23	7.68	2.86	0.18	0.10	13.5	8.65
H24	6.30	2.03	0.17	0.10	13.5	8.41
Notes: Concentrations are for 2019 except for the following: SO ₂ 2001, CO 2001, Benzene 2010.						

⁴⁴ Defra, Background Maps, <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html> (accessed 9/9/2020)

5.7 Background concentrations at sensitive conservation sites

Background concentrations of NO_x, SO₂ and NH₃ at the ecological receptors have been obtained from APIS designated site-specific values for SSSIs, SACs and SPA which are provided on a 1km basis, and the APIS location-specific values for the Local LWS, NNRs, LNRs and AW which are provided on a 1km to 5km basis. Concentrations are an average for the years 2018-2020 and are presented for each receptor in Appendix D.

Site relevant background deposition fluxes for nutrient nitrogen deposition (NDep) are provided by APIS also on a 1km grid cell basis with values for deposition to woodland, moorland and a grid-averaged value; they are an average for the years 2018-2020 and are presented for each receptor in Appendix D.

5.8 Background deposition

Site relevant acid deposition due to nitrogen (NAcidDep) and sulphur (SAcidDep) are also supplied by APIS on a 1km grid cell basis. Appendix D shows the background nutrient nitrogen and acid deposition rates respectively for the relevant ecological receptors, for the habitats that are most sensitive to nitrogen and acid species. The data have been taken from the APIS web site.²¹

For nationally designated sites there are site-specific values of background deposition rates and CLO; for the locally designated sites, the NNRs, LNRs, LWS and AW, spatially varying values of background level are available for the broad habitat class.

5.9 Dust/ Particulate Matter

A number of mineral workings exist within the wider locale, the closest of which is 'Aggregate Industries North End' which provides aggregates, ready-mix concrete, crushed stone, gravel located approximately 120m to the southeast of the Site.

As shown in Table 15, the maximum concentration of PM₁₀ for any receptor considered within the study is 14.0µg/m³, based on 2019 measured concentrations, that are assumed to be representative of background concentrations at both the site and the locale as a conservative approach.

5.10 Odour

Land use in the locale of the site is principally associated with arable agriculture. Therefore, activities such as the application of manufactured and organic fertiliser may periodically characterise baseline odours within the locale. Within the wider locale, cattle and poultry farms may also account for localised baseline odours.

Data available from the Environment Agency Public Register⁴⁵ indicate that current Waste Management licenses held within 5km of the Site include those for the physical treatment facilities associated with aggregate processing or management of inert or extractive waste at mine, that are not likely to be sources of odour. Three licenses are held for the deposit of waste to land as a recovery

⁴⁵ Environment Agency Public Registers Online (<https://environment.data.gov.uk/public-register/view/index>) Accessed March 2023.

operation, that may include land spreading for agricultural benefit and produce odours analogous to the other arable land spreading activities.

Baseline odours may also include the Cirencester Wastewater Treatment Works (WwTW), located at Ashton Road, Siddington, approximately 1km northwest of the Site.

5.11 Bioaerosols

Bioaerosols are found naturally within the environment and consist of airborne particles that contain living organisms or parts of living organisms.⁴⁶ AD facilities process feedstock materials that may be a source of bioaerosols and/or depend on microorganisms to degrade the organic material, and therefore can be a source of bioaerosols.

Localised concentrations of bioaerosols will be influenced primarily by the surrounding vegetation, including woodland, in addition to agricultural activities within the wider area.

⁴⁶ Environment Agency (2018) Technical Guidance Note (Monitoring) M9 Environmental monitoring of bioaerosols at regulated facilities July 2018 Version 2.

6. Impact Assessment – Construction Phase

6.1 Vehicle Emissions from Construction Phase Traffic

The construction of the proposed development is anticipated to take approximately 70 weeks.

As detailed within the Transport Statement⁴⁷ it is anticipated that the construction process would generate less HDV traffic than the proposed development's operational phase with approximately 7,296 HDV trips forecast across the whole construction period.

This equates to an average of 27 HDV trips per day (or 54 HDV movements, 27 in and 27 out) across a 275-day year.

There would be a higher number of staff operatives associated with the construction phase, than when compared with the operational phase, with up to 50 people on site during the peak of construction activity. This represents a worst-case in LDV vehicle use as many contractors would vehicle share.

In accordance with IAQM guidance, and as outlined in Table 4, air quality screening criteria are set in terms of Annual Average Daily Traffic (AADT), defined as the average 24-hour traffic volume at a given location over 365 days/year.

In terms of AADT, the anticipated construction vehicle movements equate to the following:

- Based on the 'peak' number of 50 staff/ contractors that may be on-site any one time during the construction phase, the total daily off-site LDV movements predicted for the construction phase (worst case scenario) would be **72 LDV AADT flows** (36 arrivals and 36 departures) over 365 days.
- Total daily off-site HDV movements predicted for the construction phase (worst case scenario) would equal **40 HDV AADT flows** (maximum) (20 arrivals and 20 departures) over 365 days.

These AADT flows represent a worst-case scenario as the LDV and HDV AADT have been calculated based on all construction phase traffic movements as occurring over a period of one year (52 weeks), rather than the expected 70-week construction period.

In accordance with the DMRB (2007) and IAQM (2017) criteria as outlined in Section 3, the predicted increase in HDV and LDV AADT as a result of construction phase traffic are within screening criteria, above which would require further detailed assessment, for locations not within or adjacent to an AQMA. On this basis, it is considered that the air quality impacts associated with road traffic emissions as a result of the construction phase would have insignificant effects.

⁴⁷ SLR (March 2023) Proposed Anaerobic Digestion Facility Ashton Keynes Transport Statement.

6.2 Construction Dust

Initial screen

IAQM guidance²⁵ prescribes initial screening criteria to determine the requirement for a detailed assessment.

In accordance with the screening criteria and dust assessment method outlined in Appendix B, an assessment is required where:

- there are human receptors within 350m of the site boundary, and
- within 100m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s)
- For ecological receptors assessment is required where a receptor is situated within 50m from the site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s).

Whilst there are no ecological receptors within 50m from the site boundary, there are ecological receptors within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s). Based on the screening distance criteria, an assessment of dust impacts on human and ecological receptors is required.

The construction phase will involve earthworks, construction of site infrastructure and track out from vehicles. Dust emissions will be associated with certain construction tasks, as summarised in Table 16.

Potential sources of impacts associated with these activities include fugitive dust and PM₁₀ emissions resulting from disturbance of dusty materials by construction plant, vehicle movements and wind action. In accordance with IAQM guidance, the risk of dust impacts has been assessed for each activity.

Defining the Potential Dust Emission Magnitude

Construction activities at the Site will run concurrently, except for the earthworks phase, that has the potential to result in the largest dust impacts. The initial preparation and earthworks at the AD facility site will involve initial site strip of vegetation and topsoil followed by site levelling and landscaping. The total site area is approximately 7.4Ha (or 74,120m²). There will be a requirement to export excavated material and import stone to achieve final profiles.

Table 16 Dust emission magnitude

Activity	Dust Emission Magnitude
Demolition	
The Site is currently undeveloped agricultural land.	Not applicable
Earthworks	
The scale of the earthworks may be considered to result in a potential dust emission class that is 'large'. This classification is a function of: the total development site area (i.e. >10,000m ²), the number of earth moving vehicles required (i.e. <5 vehicles), the soil types present on-site (sandstone and siltstone truncated by mudstone ⁴⁸), the formation of bunds between 4 – 6m in height, and the volume of total material to be re-worked (expected to be approximately 44,000m ³). The earthworks phase of construction will be relatively short lived, lasting for approximately 8 weeks.	Large
Construction	
The potential dust emission class for activities associated with construction of the AD Plant infrastructure is considered to be 'medium', based on a total building volume of 25,000 - 100,000m ³ ; the use of pre-fabricated and pre-cast concrete elements for on-site construction (e.g., silage clamp side wall units, prefabricated building components and storage tanks) that would not give rise to dust. Further there would be no requirement for on-site crushing or screening or concrete batching; all concrete would be delivered ready-mixed from local suppliers.	Medium
Trackout	
Trackout from the Site may occur from the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The dust emission class for the effects of trackout is considered to be 'large', as a function of a maximum of >50 HDV (>3.5t) in any given day. The internal access roads and areas of hardstanding on the proposed AD site are to be constructed during the final stages. For the majority of the construction phase at the AD site the average unpaved on-site road length will be of between 50 - 100m.	Large

⁴⁸ Groundsure Report 12/09/2022 Land off Ashton Road, Ashton Keynes, Wiltshire, SN6 6QX. Ref: GS-9047296.

Defining the Sensitivity of the Area

Dust soiling

There are no sensitive receptors within 100m of the site (Table 51). The nearest 'high' sensitivity receptors to the site boundary, and therefore relevant to earthworks and construction phases, include (H1) which represents the gardens of the Cotswold Community residential cluster located 335m to the southwest, and H2 (residential properties 343m to the north).

Therefore, there are 10 – 100 high sensitivity receptors located at a distance of more than 200m (but <350m) from the site.

There are no receptors within 50m of the routes used by construction vehicles up to 500m from the site entrance.

In accordance with Appendix B, the sensitivity of the area to dust soiling effects on people and property from earthworks, construction and trackout is therefore considered to be '**low**'.

Human health effects

As shown in Table 15, the maximum annual mean PM₁₀ concentration for any receptor considered within the study is 14.0µg/m³, based on 2019 measured concentrations, that are assumed to be representative of background concentrations at both the site and the locale as a conservative approach.

There are therefore 10 – 100 high sensitivity receptors located more than 200m from the Site (but <350m) with an annual PM10 concentration of <24µg/m³. There are no receptors within 50m of the routes used by construction vehicles up to 500m from the site entrance.

In accordance with the criteria set out in Appendix B, the sensitivity of the area to human health impacts from earthworks, construction and trackout is therefore considered to be '**low**'.

Ecological Receptor Sensitivity

The nearest nationally designated ecological conservation site to the Proposed Development is the Cotswold Water Park SSSI, located approximately 380m to the south of the site entrance, and, at the closest extents of the designation, within 50m of routes potentially used by construction vehicles.

The Cotswold Water Park SSSI is formed from former gravel workings comprise the UK's largest marl (lime-rich) lake system. The main habitat of the SSSI is 'standing water'.⁴⁹ The Natural England citation for the CWP SSSI, states that it is of special interest for the following nationally important features: breeding birds, non-breeding birds, and Charophytes (stoneworts)^{50, 51} that are a submerged species that live in a variety of wetland and freshwater or brackish habitats.⁵²

⁴⁹ APIS <https://www.apis.ac.uk/app>

⁵⁰ Natural England Cotswold Water Park SSSI Gloucestershire, Oxfordshire, Wiltshire Notifications under Sections 28C and 28D of the Wildlife and Countryside Act 1981 (https://consult.defra.gov.uk/natural-england/cotswold-water-park/supporting_documents/Cotswold%20Water%20Park%20Notification%20Document%20notified%207%20Jan%202020.pdf)

⁵¹ Cotswold Water Park SSSI citation confirmed 1 Oct 2021 (<https://consult.defra.gov.uk/natural-england/cotswold-water-park/results>)

⁵² Environment Agency (March 2009) Stoneworts: their habitats, ecological requirements and conservation Integrated catchment science programme Science report: SC030202

APIS does not list any sensitive habitats or species for the SSSI designation. It is therefore considered that the features of the SSSI are unlikely to be affected by dust deposition. Furthermore, there is pre-existing screening in the form of vegetation (dense hedgerows and trees) on both sides of the potential routes used by construction vehicles and the ecological receptor.

Many of the established lakes are situated near active gravel extraction sites, and the area designated as CWP SSSI to the southeast of the site surrounds the active quarry and/or the associated Aggregate Industries processing operation. It is therefore considered that the interest features the standing water habitat are unlikely to be sensitive to the impacts of construction dust deposition and the designation is of '**low**' sensitivity.

Based on the distance from the Site, the ecological sensitivity of the area to earthworks and construction activities is considered to be '**low**'.

Factoring distance from the site (only a relatively small area of SSSI is within 500m of the site entrance), the spatial extent of the area potentially affected (with only the closest extents within 50m of routes potentially used by construction vehicles), and the low sensitivity of the interest features of the designation to dust, the ecological sensitivity of the area to trackout activities is considered to be '**low**'.

A summary of the outcome for defining the sensitivity of the area to impacts is provided in Table 17.

Table 17 Outcome of defining the sensitivity of the area

Potential impact	Sensitivity of the surrounding area		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Human Health	Low	Low	Low
Ecological	Low	Low	Low

Defining the Risk of Impacts

Table 18 presents the summary of dust risk as a function of the predicted dust emission magnitude (Table 16) and the sensitivity of the surrounding area (Table 17) in accordance with the criteria set out in Appendix B.

Table 18 Summary of dust risk

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low	Low	Low
Human Health	Low	Low	Low
Ecological	Low	Low	Low

(https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290960/scho0309bpsd-e-e.pdf)

In accordance with IAQM methodology for assessing construction dust impacts on human and ecological receptors the construction of the Proposed Development is considered to be of overall 'low risk'. The overall dust soiling and potential human health impact during the construction phase is therefore determined to be **not significant**.

Defining Site-specific mitigation

Based on the application of the IAQM method to determine dust risk from the construction phase, the overall risk is determined to be 'Low' and the employment of construction best practice as a minimum would ensure that no problematic dust or PM₁₀ concentrations occur during the construction process.

IAQM Mitigation Measures recommended for a low-risk site, are provided within Section 10. The mitigation measures presented are required for all sites as a minimum standard and are designed to ensure that any potential impacts during the construction phase of the development are reduced to an acceptable level.

7. Impact Assessment – Operational Phase

7.1 Operational Phase Vehicle Emissions

During the operational phase, it is anticipated that there would be up to four on-site personnel in attendance each day on-site in addition to incidental visits associated with provision of spare parts and consumables and third-party technicians.

The projected number of LDV movements (cars and LDVs) associated with the operational phase are summarised in Table 19.

Table 19 LDV forecast

Plant Operations	Number	Mode	Movements per week per vehicle	Annual vehicle trips	Annual 2-way movements
Staff	4	Car	5	1040	2080
Spare parts & consumables	1	LGV	3	156	312
Third party technicians	1	LGV	3	156	312
Total				1,352	2,704
LDV AADT				4	8

The total number of annual two-way LDV movements during the operational phase of the Proposed Development, would equate to an LDV AADT of 8 movements per day i.e., 4 LDV arrivals and 4 LDV departures from the Site over 365 days.

Table 20 summarises the calculated annual HDV movements as provided in the Transport Statement.

During the operational phase approximately 12,530 HDV trips are forecast. This equates to an AADT of 68 HDV movements per day i.e., 34 HDV arrivals and 34 departures from the Site across 365 days.

In summary during the operational phase:

- An AADT flow of **8 LDV** movements per day is forecast
- An AADT flow of **68 HDV** movements per day is forecast

Therefore, based on the average daily traffic flow projections and in accordance with the DMRB and IAQM indicative screening criteria, it is considered that the potential air quality impacts associated with road traffic emissions as a result of the operational phase of the development would be insignificant and that no further detailed assessment is required.

It is important to note that whilst the proposed site traffic would be new to the application site, a large proportion of the traffic movements are already on the local network as the proposed AD Facility would service existing local farms which have an existing traffic generation. This has been quantified in the Transport Statement as approximately 5,843 annual loads which make up a large proportion (47%) of the proposed 12,530 annual loads.

Table 20 HDV/ Tractor traffic forecast

	Tonnes Per Annum	Vehicle Type	Payload (t/m3)	Annual HGV/ Tractor Trips	Delivery Range
IMPORTS					
Rye Silage	15,000	All	-	1,004	Mid-June to mid-July
	2,250	HGV	24	94	
	12,750	Tractor	14	911	
Maize Silage	12,000	All	-	804	Mid-Sep to mid-Oct
	1,800	HGV	24	75	
	10,200	Tractor	14	729	
Grass Silage	14,000	All	-	938	May to Sep
	2,100	HGV	24	88	
	11,900	Tractor	14	850	
Straw	20,000	HGV	24	834	All year
Poultry Litter	15,000	HGV	26	577	All year
Farmyard Manures	10,000	Tractor	-	715	All year
Slurry	5,000	HGV	25	200	
EXPORTS					
Biomethane	9,815,904	HGV	12,500m³	786	All year
CO₂	13,714,103	HGV	24.89	551	All year
Digestate (Solid)	49,755	All	-	3,037	All year
	17,414	HGV	24	726	
	32,341	Tractor	14	2,311	
Digestate (Liquid)	67,568	All	27	3,084	All year
	50,676	HGV	27	1,877	
	16,892	Tractor	-	1,207	
TOTAL	-	-	-	12,530	-
Source: SLR Transport Assessment April 2023					
Number in black are totals of the numbers in grey below them					

7.2 Operational Phase Dust Emissions

Dust Assessment Screening

IAQM guidance acknowledges that the greatest potential for high rates of dust deposition (large particles $>30\mu\text{m}$ in size) and elevated PM_{10} concentrations occur within 100m of a dust generating activity. Intermediate-sized particles (10 to $30\mu\text{m}$) may travel up to 400m whilst particles less than $10\mu\text{m}$ have the potential to travel beyond 400m but with minimal significance due to dispersion.

On this basis IAQM guidance prescribes simple initial distance-based screening criteria to determine the requirement for a detailed assessment. For mineral sites, a detailed dust assessment is required:

- For dust soiling ('dis-amenity dust') if there are relevant human and/or ecological receptors within 250m of dust generating activities involving soft rock (sand and gravel) or 400m (for hard rock e.g., granite)
- For particulate matter (PM_{10}) if there are sensitive receptors within 1 km

There are no conservation sites within 250m of proposed on-site operations that may potentially generate dust, although there are human receptors within 250m. Therefore, further assessment for the potential impact of deposited dust and PM_{10} on human receptors is required.

Potential Dust Sources

The on-site activities that may have the potential to generate dust are outlined in Table 21.

As identified within section 5, there is one potential third party dust source within the locale, namely, 'Aggregate Industries North End' which provides aggregates, ready-mix concrete, crushed stone, and gravel located approximately 120m to the southeast of the Site.

As shown in Table 15, the maximum annual mean PM_{10} concentration for any receptor considered within the study is $14.0\mu\text{g}/\text{m}^3$, assumed to be representative of background concentrations at both the site and the locale as a conservative approach.

The overall Residual Source Emissions, that is the potential dust emissions after designed-in mitigation measures have been taken into account, is considered to be 'Medium', as a conservative approach and to take account of the nearby Aggregate Industries processing site.

Table 21 Potential dust sources

Process	Dust Source	Nature of emission	Frequency and duration	Source Dust Potential
Feedstock delivery	Crops - would be delivered freshly cut on farm trailers into open clamps and covered following the loading period at the end of the shift. Straw – fresh from source and delivered into a partially enclosed straw bunker. Manure – imported on covered trailers and unloaded within an enclosed building with air extraction and abatement.	Crops – moderate, some moisture content Straw – moderate to high, very low moisture content Manure – low, moderate moisture content	Crops - Stocking of the clamps in line with harvest periods will be temporary in nature. Once in place, the material will be covered with an impermeable cover to ensure correct storage conditions for ensiling. Straw – delivered daily Manure – delivered daily	Small – feedstock material will be delivered ‘fresh’ from source and with moderate moisture content, and/or delivered within an enclosed building, partially covered structure and/ or will be covered following receipt at the site.
Feedstock storage	Crops - would be stored within a clamp covered with plastic sheeting to prevent the ingress of rainwater. The clamp face would be re-covered following silage removal. Straw – stored within a partially enclosed bunker. Manure – stored within an enclosed building with air extraction and abatement.	Crops – negligible during storage Straw – low during storage Manure – negligible during storage	Crops – maximum storage volumes following harvest Straw – storage volumes limited by bunker size Manure – storage volumes limited by building size	Negligible to Small – feedstock stored under cover or within buildings.
Solids feeder loading	Dust release during transfer to and from within feeders.	Agitation and deposition of some materials that are potentially dusty	Daily loading operations undertaken in two phases, for a total duration of up to 4 hours	Small: The external hoppers are situated within close proximity of the clamps to minimise haulage distances. With the exception of straw, feedstock materials will have medium to high moisture content. Silage will be transferred using a front-end loader and carefully placed into the hoppers to limit any potential dust emissions.

Process	Dust Source	Nature of emission	Frequency and duration	Source Dust Potential
Vehicle movements	Vehicle movements across areas of hardstanding.	Potential for entrainment of deposited material.	Associated with daily loading, importation of feedstock and export of digestate	Small: Movements restricted to operational areas that will be cleared regularly following un/loading.
Solid digestate storage	Solid digestate (fibre)	Stored within an enclosed building	Negligible emissions during storage within building	Small: solid digestate will have a moderate moisture content following separation and is unlikely to dry out significantly during temporary storage (typically 1 to 2 days) within the building.
Solid digestate off-take	Solid digestate (fibre)	Agitation and deposition of some materials that are potentially slightly dusty.	Loading undertaken once per day for a duration of 20 – 30 minutes. Material will have medium moisture content.	Small: solid digestate will have a moderate moisture content. Loading periods will be intermittent and brief (once per day for 30 minutes duration).

Determination of pathway effectiveness of dust to receptor

The site-specific factors considered to determine the pathway effectiveness include distance, direction of receptors relative to the prevailing wind directions and wind speed.

As per IAQM guidance, the threshold wind speeds for initiation of wind blow can range from 2.4 m/s ("light breeze") up to gale force, depending on the particle size. A moderate breeze, of 5.5 m/s and above, may be used as a general threshold.

Table 22 presents directional wind data analysis, derived from Global Forecasting System (GFS) meteorological data for the Proposed Development site for a 5-year period. The data are also represented as windroses in Figure 4. The prevailing wind directions are predominantly from the south southwest, southwest, west southwest and west. The prevalence of winds from these directions means that those receptors that lie broadly to the northeast, of the Proposed Development will be those most frequently 'downwind' of the Site.

Table 22 Wind analysis (For location: latitude 51.661, longitude -1.942)

Speed\ Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
<0.3	0.02	0.00	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.22
0.3 - 1.0	0.13	0.16	0.14	0.13	0.14	0.14	0.11	0.13	0.12	0.16	0.16	0.13	0.15	0.23	0.19	0.16	2.40
1.0 - 2.5	1.17	0.95	1.14	1.15	0.91	0.85	0.80	0.85	1.18	1.41	1.65	1.89	1.72	1.65	1.42	1.54	20.3
2.5 - 5.0	2.00	1.74	2.69	2.40	2.08	1.18	1.30	1.91	2.74	3.85	4.67	5.54	4.15	2.44	2.10	2.65	43.5
5.0 - 7.5	0.54	0.66	1.41	1.41	0.64	0.63	0.63	0.93	1.52	2.80	3.54	3.99	2.49	1.28	0.58	0.69	23.7
7.5 - 10.0	0.06	0.09	0.30	0.36	0.13	0.10	0.13	0.30	0.74	1.15	1.10	1.63	0.96	0.31	0.17	0.13	7.67
10.0 - 12.5	0.01	0.01	0.03	0.07	0.00	0.00	0.01	0.05	0.18	0.46	0.35	0.37	0.28	0.06	0.03	0.05	1.95
>12.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.07	0.06	0.01	0.01	0.00	0.01	0.26
Total	3.94	3.61	5.72	5.55	3.93	2.93	2.99	4.18	6.50	9.94	11.6	13.6	9.78	5.99	4.52	5.25	100

Source: A&S Modelling & Data (<https://asmodata.co.uk/>)

The determination of the pathway effectiveness presented in Table 23 for each receptor is based on the distance between sensitive receptors and on-site dust generating activities and the frequency of wind speeds >5m/s that are towards the receptor.

Table 23 Estimation of pathway effectiveness

ID	Receptor Description	Nearest potential on-site dust source	Approx. distance from dust source	Wind sectors towards receptor	Approx. % of time winds >5m/s towards receptor	Frequency category	Receptor Distance category	Pathway effectiveness
H22	Footpath	Digestate loading	240	NW	0.78	Infrequent	Distant	Ineffective
H23	Footpath	Straw bunker	200	S	2.45	Infrequent	Intermediate	Ineffective
H25	Industrial	Digestate loading	190	NW	0.78	Infrequent	Intermediate	Ineffective

Determination of likely dust effect of the Proposed Development

The adopted approach is based on a qualitative risk assessment technique, that follows IAQM (2016) guidance for assessing the impacts from mineral workings. Following this approach, the source residual dust potential was determined to be 'Medium', as a conservative approach and to take account of the nearby Aggregate Industries processing site. Based on the ineffective source pathway between the on-site activities and the low sensitivity of receptors, all of which are located >190m from the Proposed Development, the likely dust effect is predicted to be 'negligible' at the identified receptors (Table 24). Overall, the potential dust soiling impact associated with the operation of the development is therefore considered to be 'not significant'.

Table 24 Determination of likely dust effects

ID	Receptor Description	Residual source emission	Pathway effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of dust effects
H22	Footpath	Medium	Ineffective	Negligible Risk	Low	Negligible effect
H23	Footpath	Medium	Ineffective	Negligible Risk	Low	Negligible effect
H25	Industrial	Medium	Ineffective	Negligible Risk	Low	Negligible effect

Human health effects

There are no high sensitivity receptors within 250m from on-site dust generating activities. The maximum annual background PM₁₀ concentration is 14µg/m³ for the 1km grid covering the Site and nearby receptors (Table 15). The 2019 background concentration represents approximately 35% of the AQAL for PM₁₀. Further, there has been a long-term decrease in background particulate matter (PM₁₀, PM_{2.5}) concentrations, in part due to reductions in road traffic exhaust emissions, and therefore the 2019 concentrations presented represent the more conservative estimate.

It is therefore considered that the Proposed Development would be very unlikely to increase background concentrations of PM₁₀ such that levels would exceed the relevant AQAL. It is therefore considered that the potential impact of PM₁₀ from the operation of the Proposed development on human health would be negligible and therefore not significant.

7.3 Impact assessment of air quality on human receptors

Odour

Source Odour Potential

The Proposed Development has been risk-assessed following the IAQM methodology in terms of the potential for odour impact in the locale.

An outline of the proposed processes at the AD Plant and corresponding source odour potential are provided in Table 25.

The AD plant will process up to 91,000 TPA, of which approximately 5% will comprise liquid feedstock material that will be delivered to the AD Plant in a sealed system with no on-site emission points. Of the solid feedstock, 67% will comprise straw and crop silage, that will have negligible to low odour potential during delivery and storage although with the potential for moderate odours during transfer into the AD system following storage. The remaining 28% will comprise manures that will be stored temporarily within a building on-site, that will incorporate air extraction and treatment.

These materials, that include manures already produced and/or stored within the wider site locale, will be exposed to air for brief periods (<4 hours total per day), and only when required for loading. Manure will contain moderately odorous compounds; EA H4 guidance classifies odours associated with 'intensive livestock rearing' as 'Moderately offensive' odours.

Solid (fibre) digestate will be separated and temporarily stored within an on-site building (typically, for less than two days) prior to transfer off-site. Fibre digestate is expected to also contain low to moderately odorous compounds and be slightly unpleasant to unpleasant (-1 to -2 in hedonic tone).

Odours from the manure feedstock and solid digestate are considered to be 'unpleasant' and will intensify when the materials are agitated. Both sources are determined as having a 'Medium' source odour potential and are therefore regarded as the main potential odour sources from the AD Plant. The potential for impact from these sources will be limited by restricted available storage at the site and short holding times. Further, the type of odours will be analogous to the existing farming operations in the locale.

As a conservative approach, the overall source odour potential for the AD Plant is considered to be '**Medium**'.

Table 25 Potential odour sources

Process	Odour Source	Nature of emission	Intensity and offensiveness	Frequency and duration	Source Odour Potential
Solid feedstock delivery	Maize and rye silage, crop residue, FYM, poultry litter	Transient odour release during open-air transfer of maize, rye, brought in from farms (via tractor and trailer). Straw low odour. FYM and poultry litter sheeted when transported and delivered into purpose-built building.	Silage/ crop residues - low to medium intensity and offensiveness, fresh low odour and silage sweet/ fermented odour. Correct storage conditions should ensure silage product not degraded and/or malodorous. Straw is not odorous. FYM – medium to high intensity and offensiveness, cattle manure odour. Poultry litter - medium to high intensity and offensiveness, (urea/ fish odour).	There will be 2 – 4 deliveries per day of chicken manure, delivered in accordance with loading requirements.	Medium: The odours from some feedstocks being transported e.g., manures, may be of medium to high intensity and offensiveness. On-site provision for storing poultry litter and manure will be within an enclosed building that includes an emissions extraction and abatement system. Selected, type and quality with waste acceptance criteria. Odours released during transfer will be analogous to baseline odours.
Liquid feedstock delivery	Cattle slurry	Slurry will be pumped to the digesters. The on-site conveyance system will be sealed. Therefore, there is no emission to air from this source at the AD Plant during normal operations.	Cattle slurry – medium to high intensity and offensiveness, cattle manure odour. Conveyance within sealed system, therefore no source odour potential at the AD Plant.	Continuous transfer to 5 No. digesters within sealed system. No emission to air during normal operations.	Negligible: on-site source odour potential
Solid feedstock storage	Maize and rye silage, crop residue, FYM, poultry litter	Odours from silage/ crop residue material in temporary storage. Silage covered within purpose-built silage clamps. Straw low odour and delivered into purpose-built building for storage.	Silage/ crop residues - low to medium intensity and offensiveness, sweet/ fermented odour. Correct storage conditions off-site should ensure silage product not degraded and/or malodorous.	Intermittent. Some feedstock to be received on a just in time basis, with limited provision for temporary storage on hardstanding prior to loading. Potential for short-term on-storage of silage/ crop residues prior to loading. Maximum	Small: Low odour potential from open face of silage clamp. Straw low potential for odour as stored within building and low odour. On-site provision for storing poultry litter and FYM will be within an enclosed building that includes an

Process	Odour Source	Nature of emission	Intensity and offensiveness	Frequency and duration	Source Odour Potential
		FYM and poultry litter stored within purpose-built building with abatement to mitigate emissions.	FYM – medium to high intensity and offensiveness, cattle manure odour. Poultry litter - medium to high intensity and offensiveness, (urea/ fish odour). Typically, silage will be stored in covered silage clamps on site.	residence time in temporary stockpile <2 hours. On-site provision for storing poultry litter will be within an enclosed building that includes an emissions extraction and abatement system. Straw is not odorous.	emissions extraction and abatement system so odour potential mitigated. Selected, type and quality with waste acceptance criteria.
Liquid feedstock storage	Cattle slurry	Slurry pumped in sealed system to the digesters. No emission to air during normal operations.	Cattle slurry – medium to high intensity and offensiveness, cattle manure odour. Storage at the AD Plant is within a sealed system, therefore no source odour potential at the AD Plant.	Continuous, within sealed system. No emission to air during normal operations.	Negligible on-site source odour potential.
Solids feeder loading/ operation	Feedstock material (in bucket loader and solids feeder)	Odour release during transfer to and from within feeders.	Agitation and deposition of some materials that are potentially of medium to high intensity and offensiveness.	Intermittent, loading in two phases, takes <4 hours (in total) per day.	Medium: After manure is placed into the hoppers, a 0.5m layer of silage will be used to cover the material within the feeders to reduce the potential for odour emissions. This method is used in preference to lids, which may cause heating and a build-up of odours which are then released in a burst as the lid is opened for loading.
Anaerobic digestion	'Raw biogas' and/or whole digestate	Digestion process takes place in sealed, airtight vessels. There are no emissions, other than	Biogas - high intensity and offensiveness, (sweet, sulphurous). Sealed system,	Intermittent and brief release of biogas from PRVs only, under abnormal operating	Negligible on-site source odour potential

Process	Odour Source	Nature of emission	Intensity and offensiveness	Frequency and duration	Source Odour Potential
		from pressure relief valves (PRVs); a safety feature that operate only in (abnormal) over or under-pressure scenarios. PRV emissions released at height that will ensure effective emissions dispersal.	therefore, no source odour potential at the AD Plant other than abnormal operation of the PRV (safety devices).	conditions. No emission to air during normal operations.	
Digestate separation	Whole digestate within separator	Odorous air within separator, contained within building.	Digestate – medium intensity and offensiveness. Agricultural, 'sharp'/ fermented type odours.	Continuous (daily), however separator will be within a building.	Small: Residual release from building and/or when access is required.
Solid digestate storage and off-take	Separated solid (fibre) digestate	Odours released from surface of material when transferred. but contained within building.	Solid digestate – low to medium intensity and offensiveness. Agricultural, 'sharp'/ fermented type odours.	Separated fibre will be contained within a building. Typically, the fibre will be stored for up to 2 days. Fibre will be loaded into trailers outside the Separator building, one load per day, for a duration of approximately 20 - 30 minutes.	Low - Medium: intensity and offensiveness odours, restricted quantities held on-site for limited periods of time (per batch within building).
Liquid digestate storage	Separated liquid digestate (liquor)	Liquid digestate is fully contained the network of sealed pipework for re-use within AD process	Liquid digestate – medium intensity and offensiveness. Agricultural, 'sharp'/ fermented type odours.	Continuous, however, liquid digestate is fully contained the network of sealed pipework for re-use within AD process; or transferred off-site in sealed tankers.	Negligible to low on-site source odour potential
Combustion	Combusted biogas	1No. emergency flare. Emissions released at height that will ensure effective emissions dispersal.	Combusted biogas – very low intensity and offensiveness. The combustion of biogas will	Flare will be installed as a safety feature only and will be used infrequently (typically between 2% - 8% of the year).	Negligible on-site source odour potential

Process	Odour Source	Nature of emission	Intensity and offensiveness	Frequency and duration	Source Odour Potential
			destroy any potential odorous compounds.		
Combustion	Combusted natural gas	2 No. gas engines. Emissions released at height that will ensure effective emissions dispersal.	Combusted natural gas – negligible to very low intensity and offensiveness. The combustion of natural gas will destroy any potential odorous compounds.	Gas engines - continuous operation, except for maintenance.	Negligible on-site source odour potential
Biogas upgrading	Upgraded/ cleaned biogas ('biomethane'), or 'raw' biogas	1 No. Gas Upgrading Unit will incorporate a PRV for over-pressure situations as a safety feature and when activated there would be an intermittent release of odorous biogas. Emissions from PRVs released at height that will ensure effective emissions dispersal. There should be no odorous emission to air during normal operations.	Biomethane – negligible to very low intensity and offensiveness. 'Raw' biogas – medium to high intensity and offensiveness. Odorous compounds within the biogas, principally H ₂ S, are removed in the desulphurisation process and filters prior to gas upgrading. No source odour potential at the GUU other than very infrequent operation of the PRV (safety devices).	Continuous during normal operating conditions, however the residual 'off-gas' will be principally CO ₂ that is odourless at low concentrations. The proposal includes CO ₂ capture. During abnormal operating conditions there may be a brief, intermittent release of 'raw' biogas from the operation of the GUU PRV(s) only. No emission to air of biogas during normal operations.	Negligible on-site source odour potential during normal operations

Pathway effectiveness

The principal sources will be open processes with low-level releases. There are no topographical features in the immediate locale that would affect the dispersion of odours, although on-site infrastructure (large tanks, vessels) in addition to the change in levels across the Site will influence localised dispersion.

The nearest high sensitivity residential receptors to the Proposed Development are approximately 335m southwest of the site boundary, and approximately 400m from the nearest potential on-site odour source. The closest recreational facility (a sailing club) is located approximately 305m to the east southeast of the Site, and 430m from the nearest on-site odour source. An existing network of public footpaths are within close proximity of the Site, the closest of which is 100m to the southeast. Low wind speeds are those which represent the greatest risk of poor odour dispersion.

Table 26 presents the estimation of pathway effectiveness, that considers the distance between the nearest on-site odour source, namely the solids feeders, and the receptor together with the frequency of winds.

The Pathway Effectiveness is determined to be 'ineffective' for all receptors considered, with the exception of a 'moderately effective' pathway to receptors H15 Aggregate Industries, and locations H22, H23, H24 selected as representative of footpaths to the northwest, south and east of the Site respectively.

Table 26 Estimation of pathway effectiveness

ID	Description	Nearest potential odour source	Approx. distance from odour source	Receptor bearing from source	Approx. % of time winds from source to receptor	Pathway effectiveness
H1	Residential	Storage bag 1	400	SW	5.72	Ineffective
H2	Residential	Feed hopper 1	414	N	6.50	Ineffective
H3	Residential (Town)	Feed hopper 1	630	ENE	13.6	Ineffective
H4	Residential	Storage bag 2	795	SSW	3.61	Ineffective
H5	Residential	Feed hopper 1	860	N	6.50	Ineffective
H6	Residential	Storage bag 2	1,010	S	3.94	Ineffective
H7	Primary School	Feed hopper 1	570	NNE	9.94	Ineffective
H8	Leisure	Separator	430	ESE	5.99	Ineffective
H9	Leisure	Storage bag 2	425	S	3.94	Ineffective
H10	Leisure	Feed hopper 1	675	N	6.50	Ineffective
H11	Leisure	Clamp	707	NW	2.99	Ineffective
H12	Leisure	Separator	1,030	ESE	5.99	Ineffective
H13	Leisure	Storage bag 1	987	W	3.93	Ineffective
H14	Leisure	Separator	1,090	E	9.78	Ineffective
H15	Industrial	Separator	260	SE	4.52	Moderately effective
H16	Industrial	Clamp	530	WNW	2.93	Ineffective
H17	Industrial	Chicken shed	960	NNW	4.18	Ineffective
H18	Commercial / Industrial	Feed hopper 3	585	E	9.78	Ineffective
H19	Commercial	Feed hopper 1	535	N	6.50	Ineffective
H20	Commercial	Feed hopper 1	630	N	6.50	Ineffective
H21	Allotments	Feed hopper 1	655	NNE	9.94	Ineffective
H22	Footpath	Separator	240	SE	4.52	Moderately effective
H23	Footpath	Feed hopper 1	225	NE	6.50	Moderately effective
H24	Footpath	Clamp	365	W	3.93	Moderately effective
H25	Industrial	Separator	190	SE	4.52	Moderately effective

Receptors

Risk of odour exposure (impact)

The risk assessment matrices in Appendix C have been used to establish that the odour exposure risk as a result of the proposed operations at the AD plant, is considered to be 'Negligible' at all locations, with the exception of a 'Low Risk' of odour exposure at receptor H15 Aggregate Industries, and receptor locations H22, H23, H24 that represent footpaths to the northwest, south and east of the Site respectively.

Determination of likely odour effect of the Proposed Development

The adopted approach is based on a qualitative risk assessment technique, that follows IAQM (2018) guidance¹⁸ for assessing odour impact for planning.

Following this approach, the overall source odour potential for the AD Plant was determined to be 'Medium'. For the evaluation of pathway effectiveness, a key determining factor was the separation distances between potential odour sources and 'high sensitivity' receptors in the locale who may have relevant amenity concerns, or due to the low sensitivity of those nearest to the Proposed Development.

In accordance with the matrices provided in Appendix C, the estimated odour effect (impact) of the Proposed Development has been determined for all receptor locations (Table 25). As shown in Table 25 the potential impact is determined to be 'Negligible' at all locations. Overall, the potential odour impact associated with the operation of the development are therefore considered to be 'not significant'.

Table 27 Summary of the likely odour effects at existing sensitive receptors

Receptor	Overall source odour potential	Pathway effectiveness	Odour exposure risk	Receptor sensitivity	Likely odour effect
H1	Medium	Ineffective	Negligible	High	Negligible effect
H2	Medium	Ineffective	Negligible	High	Negligible effect
H3	Medium	Ineffective	Negligible	High	Negligible effect
H4	Medium	Ineffective	Negligible	High	Negligible effect
H5	Medium	Ineffective	Negligible	High	Negligible effect
H6	Medium	Ineffective	Negligible	High	Negligible effect
H7	Medium	Ineffective	Negligible	High	Negligible effect
H8	Medium	Ineffective	Negligible	Medium	Negligible effect
H9	Medium	Ineffective	Negligible	Medium	Negligible effect
H10	Medium	Ineffective	Negligible	Medium	Negligible effect
H11	Medium	Ineffective	Negligible	Medium	Negligible effect
H12	Medium	Ineffective	Negligible	High	Negligible effect
H13	Medium	Ineffective	Negligible	Medium	Negligible effect
H14	Medium	Ineffective	Negligible	Medium	Negligible effect
H15	Medium	Moderately effective	Low	Medium	Negligible effect
H16	Medium	Ineffective	Negligible	Medium	Negligible effect
H17	Medium	Ineffective	Negligible	Low	Negligible effect
H18	Medium	Ineffective	Negligible	Medium	Negligible effect
H19	Medium	Ineffective	Negligible	Medium	Negligible effect
H20	Medium	Ineffective	Negligible	Medium	Negligible effect
H21	Medium	Ineffective	Negligible	Medium	Negligible effect
H22	Medium	Moderately effective	Low	Low	Negligible effect
H23	Medium	Moderately effective	Low	Low	Negligible effect
H24	Medium	Moderately effective	Low	Low	Negligible effect
H25	Medium	Moderately effective	Low	Low	Negligible effect

7.4 Bioaerosols

There are two potential receptors located within 250m of the Proposed Development, although neither are considered to represent locations of relevant exposure.

The South Cerney automated Telephone Exchange is located 187m from the nearest potential source of bioaerosols at the Proposed Development (the digestate Separator Building). However, it is expected that site personnel would not be required on-site at the automatic Telephone Exchange except infrequently for maintenance.

The distance between the nearest area of the Aggregate Industries yard is greater than 250m (approximately 260m) to the nearest potential source of bioaerosols at the Site (the digestate Separator Building). Furthermore, any potential exposure at this location would be transient.

It is therefore considered that further evaluation of bioaerosols impact at these locations is not required.

7.5 Other emissions to air

Sensitivity Tests

Sensitivity of the impacts to three parameters have been investigated, including the year of meteorological data, building effects and terrain effects. For each of the 15 models runs the maximum value at the relevant receptors (human or ecological) for each pollutant-statistic combination was calculated. The results are presented in Appendix E (Table 57).

The maximum predicted impact for each pollutant at each human receptor is given in Appendix F. In this section the highest results are presented, that is, the impacts at the worst-case receptor.

Two operating scenarios have been considered namely, the realistic (factored) operating scenario of the plant in the determination of long-term impacts, and for the determination of short-term impacts, only the worst-case operating scenario is assessed.

Impacts have been assessed with respect to the IAQM significance criteria given in section 4.8.

Long-term impacts on human receptors

The maximum long-term concentrations for each AQAL, across all receptors and all meteorological years, and the worst of with/ without buildings and with/without terrain are given in Table 28. The predicted concentrations, with and without background concentrations, have been compared with the AQAL. Long-term AQALs are not applicable at the workplaces and recreational locations where the public are unlikely to spend long periods of time.

Annual mean nitrogen dioxide (NO₂)

The maximum long-term NO₂ PC is 1.9% of the AQAL at receptor H3, a location representative of South Cerney (Town), approximately 555m to the east northeast of the Site. The PC in addition to the background concentration (PEC) is 27% and is therefore less than 75% of the AQAL. In accordance with IAQM criteria, the magnitude of change would be negligible.

Annual mean particulate matter (PM₁₀ and PM_{2.5})

The maximum long-term PM₁₀ PC is 0.1% of the AQAL at receptor H3, South Cerney (Town). The PC in addition to the background concentration (PEC) is 35% and is therefore less than 75% of the AQAL. In accordance with IAQM criteria, the magnitude of change would be negligible.

The maximum long-term PM_{2.5} PC is 0.2% of the AQAL at receptor H3. The PC in addition to the background concentration (PEC) is 43% of the AQAL (20µg/m³) and 87% of the target to be met by 2040 (10µg/m³). In accordance with IAQM criteria the magnitude of change would be negligible in respect of both limits.

Annual mean TVOCs (as 10% benzene)

The maximum long-term TVOC (as 10% benzene) PC is 5.5% of the AQAL at receptor H3, South Cerney. The PC in addition to the background concentration (PEC) is 9.1% and is therefore less than 75% of the AQAL. The magnitude of change would be regarded as negligible.

Annual mean ammonia (NH₃)

The maximum long-term impacts for NH₃ are predicted at residential receptor H1, a location representative of Cotswold Community (residential cluster), approximately 335m to the southwest of the Site. For the proposed operation the predicted PC (0.07µg/m³) is 0.04% of the AQAL. The PC in addition to the background concentration (PEC) is 1.3% and is therefore less than 75% of the AQAL. In accordance with IAQM criteria, the magnitude of change would be negligible.

Annual mean hydrogen sulphide (H₂S)

The maximum long-term impacts for NH₃ are predicted at residential receptor H3. The predicted PC (0.001µg/m³) is 0.001% of the AQAL. The magnitude of change would be regarded as negligible.

The long-term impacts at all receptors from the Proposed Development can therefore be regarded as **not significant**.

Table 28 Results, long-term AQAL

Pollutant	AQAL (µg/m ³)	PC (µg /m ³)	PC/AQAL (%)	PEC (µg /m ³)	PEC/AQAL (%)	Receptor	Predicted Impact
Worst-case scenario							
NO ₂	40	0.77	1.92%	10.7	27%	H3	Negligible
PM ₁₀	40	0.04	0.09%	13.5	34%	H3	Negligible
PM _{2.5}	20	0.04	0.18%	8.69	43%	H3	Negligible
PM _{2.5}	10	0.04	0.18%	8.69	87%	H3	Negligible
Benzene	5	0.27	5.47%	0.46	9.1%	H3	Negligible
NH ₃	180	0.07	0.04%	2.37	1.3%	H1	Negligible
H ₂ S	140	0.001	0.001%	0.001	0.001%	H3	Negligible
Notes: Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest							

Short-term impacts on human receptors

Table 29 shows the comparison of predicted short-term impacts, from 15 minutes to 24 hours. The predicted concentrations have been compared with the AQALs in accordance with IAQM (2017) Land-use Planning guidance and, where applicable, compared with the available headroom and in accordance with EA/Defra AERA (2023) guidance.

The prediction of short-term impacts is conservative in several respects:

- Results at the receptors were calculated as the maximum value at each receptor from 15 model runs and are therefore worst-case values across all five years, all model option scenarios that includes the impact of meteorological data year, buildings, and terrain.

- It assumes the following proposed combustion plant will operate at full load, continuously all year, i.e., 8,760 hours, whereas in practice the following operational profiles are anticipated:
 - the boilers will operate intermittently according to peak demand for approximately 50% of the time;
 - the emergency flare will be used as an emergency safety feature only (typically <10% of the year maximum).
- It is unlikely that the emergency flare and CHP would ever operate simultaneously as the role of the flare is to consume biogas when it is not burnt in the CHP.
- Assuming the NO₂ and SO₂ emissions will be at the MCPD ELVs for the CHP, and NO_x and TVOC emissions at the ELVs for the emergency flare.
- It has been assumed that benzene is 10% of the emitted TVOC (Appendix D) but this is an upper bound and the benzene may be a lower percentage.

Table 29 Results, short-term AQAL

Pollutant	Statistic	AQAL ($\mu\text{g}/\text{m}^3$)	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	Headroom ($\mu\text{g}/\text{m}^3$)	PC/Headroom (%)	PEC/AQAL (%)	Receptor	Predicted Impact
NO ₂	99.79 th 1h	200	20.3	10%	180	11%	20%	H25	Negligible
PM ₁₀	90.41 st 24h	50	0.12	0.2%	23.1	0.5%	54%	H2	Negligible
SO ₂	99.9 th 15min	266	19.4	7.3%	261	7.4%	9.0%	H22	Negligible
SO ₂	99.73 rd 1h	350	12.1	3.5%	345	3.5%	4.7%	H22	Negligible
SO ₂	99.18 th 24h	125	0.99	0.8%	119	0.8%	5.4%	H3	Negligible
CO	Max daily 8h*	10000	178	1.8%	9794	1.8%	3.8%	H22	Negligible
Benzen e	24h average	30	0.27	0.9%	29.6	0.9%	2.1%	H3	Negligible
NH ₃	1h average	2500	37.5	1.5%	2495	1.5%	1.7%	H25	Negligible
H ₂ S	24h average	150	0.001	0.001 %	150	0.001%	0.001%	H3	Negligible
Notes: *Maximum daily 8h running Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest									

Nitrogen dioxide (NO₂)

The maximum short-term NO₂ PC (20.3 $\mu\text{g}/\text{m}^3$) is 10% of the AQAL at receptor H25, a location representative of the nearby automatic telephone exchange approximately 80m southeast of the Site. In accordance with IAQM (2017) Land-use Planning guidance, for short-term concentrations (those averaged over a period of an hour or less) a PC 10% of the AQAL is just within the range (of <10%) whereby the severity of the impact would be regarded as 'Negligible' and therefore not significant at the individual receptor (Table 13).

Particulate matter (PM₁₀)

The maximum 24-hour short-term PM₁₀ PC is 0.2% of the AQAL at receptor H2, <10 residential properties approximately 343m to the north of the Site. In accordance with EA/Defra AERA (2023) guidance criteria, the PC is less than 10% of the AQAL and therefore not significant at these receptors (Table 13).

Sulphur dioxide (SO₂)

The maximum 15-minute short-term SO₂ PC (19.4 $\mu\text{g}/\text{m}^3$) is 7.3% of the AQAL, and the maximum 1-hour short-term SO₂ PC (12.1 $\mu\text{g}/\text{m}^3$) is 3.5% of the AQAL both occur at receptor H22, a nearby footpath situated approximately 100m to the southeast of the Proposed Development. In accordance with IAQM (2017) Land-use Planning guidance descriptors for the change in concentrations for short-term impacts, both are considered as 'negligible' and therefore the effect **not significant**.

The maximum 24-hour short-term SO₂ PC (0.99µg/m³) is 0.8% of the AQAL, is predicted to occur at H3. In accordance with EA/Defra AERA (2023) guidance criteria, the PC is less than 10% of the AQAL. The potential effect of 24-hour short-term SO₂ at locations of relevant exposure may therefore be considered **not significant**.

Carbon monoxide (CO)

The maximum short-term CO PC (178µg/m³) is 1.8% of the AQAL at receptor H22, a nearby footpath to the southeast of the Site. The magnitude of impact due to the predicted change in concentration relative to the short-term AQAL would be regarded as 'negligible' and **not significant** in accordance with IAQM (2017) Land-use Planning guidance.

TVOCs (as 10% benzene)

Table 29 details the results for the predicted short-term TVOCs (as 10% benzene) for the worst-case scenario at each receptor for each meteorological year. A conservative approach has been taken in the assessment of short-term TVOCs; it has been assumed that benzene is 10% of the emitted TVOC (Appendix D) but this is an upper bound and the benzene may be a lower percentage. Furthermore, the actual operational profile of the proposed combustion plant will be significantly lower than one of continuous operation that has been modelled.

The average 24-hour short-term TVOCs (as 10% benzene) PC (0.27µg/m³) is 0.9% of the AQAL, is predicted to occur at receptor H3, representative of South Cerney (Town). In accordance with EA/Defra criteria, the predicted PC is less than 10% of the AQAL and less than 20% of the available headroom (that is, the short term AQAL minus twice the long-term background concentration). The potential effect of 24-hour TVOCs (as 10% benzene) may therefore be considered not significant.

Annual mean ammonia (NH₃)

The maximum short-term impacts for NH₃ are predicted at residential receptor H25, the automated telephone exchange building, approximately 80m to the southeast of the Site. For the proposed operation the predicted PC (37.5µg/m³) is 1.5% of the AQAL. In accordance with IAQM criteria, the magnitude of change would be negligible.

Hydrogen sulphide (H₂S)

The maximum short-term impacts for H₂S are predicted at residential receptor H2, a location representative of <10 residential properties, approximately 343m to the north of the Site. The predicted PC (0.01µg/m³) is 0.01% of the AQAL. The magnitude of change would be regarded as negligible.

7.6 Impact Assessment of Air Quality on Ecological Receptors

Predicted impacts of each pollutant at each ecological receptor are given in Appendix G. In this section the highest results are presented, that is, the impacts at the worst-case receptor across all meteorological years, and the worst of with and without buildings.

Considering the nationally designated sites, SSSIs and SACs, Table 30 and Table 31 shows the maximum concentrations, with and without background concentrations, compared to the AQAL.

Again, a worst-case operating scenario has been considered in the determination of short-term impacts, namely, the continuous (unfactored) operation of the Proposed Development. However, for the determination of long-term impacts the assessment also remains conservative in assuming continuous operation of the CHPs and boilers.

Long-term impacts on ecological receptors

Annual mean NO_x and SO₂

The maximum PCs for long-term NO_x, SO₂ and NH₃ are predicted at E21 (a location representative North Meadow & Clattinger Farm SAC) (Table 30). For nationally designated SSSI sites, the maximum long-term concentrations are predicted at E6, representative of Wildmoorway Meadows SSSI, approximately 2.4km from the Site.

For these designated sites, where sensitive habitats or features are identified and Critical Levels (CLes) have been set, concentrations are not predicted to exceed 1% threshold screening value set out in EA/Defra AERA (2023) criteria and/or IAQM (2020) Conservation Sites guidance for the discrete locations modelled. Therefore, the impact of NO_x, NH₃ and SO₂ concentrations at the nationally designated sites may therefore be regarded as **not significant**.

At locally designated sites, LWSs, LNRs, NNRs and AW, Table 32 shows that the maximum PCs for long-term NO_x and SO₂ are predicted at E27 a location representative of LWS (that includes broadleaved/Coniferous unmanaged woodland Priority Habitat and CWP lake Pit 26). the maximum PCs for long-term NH₃ are predicted at E26, also representative of the LWS 'CWP lake Pit 26'. For these locally designated sites there are no predicted exceedances (100%) of the lower CLe (Table 32). In accordance with EA/ Defra guidance the long-term impact of concentrations at the local conservation sites is regarded as **not significant**.

Short-term impacts on ecological receptors

For the continuous (worst-case) operating scenario, the maximum (100th percentile) PCs for short-term NO_x are predicted at E20 (a location representative of North Meadow and Clattinger Farm SAC); and the maximum 24-hour mean was predicted at E23, also at North Meadow and Clattinger Farm SAC. The respective maximum predicted short-term NO_x PCs do not exceed 10% of the short-term threshold screening values (Table 13).

For local sites, the maximum short-term NO_x PCs, also predicted at E27 LWS ('CWP lake Pit 26') does not exceed the EA/Defra AERA (2023) guidance short-term threshold screening value, that is, 100% of the relevant standard.

Therefore, the Short-term impact of NO_x concentrations at the national and local conservation sites is regarded as **not significant**.

7.7 Annual mean nutrient nitrogen deposition

Table 34 shows the maximum predicted NDep and the percentage PC of the relevant critical load (CLo).

For SACs considered within the study, the maximum predicted PC for nutrient nitrogen deposition (NDep) is predicted at North Meadow & Clattinger Farm SAC (E21) (0.12% of the CLo); for SSSIs the maximum occurs at Wildmoorway Meadows SSSI (E6) (0.26% of the CLo). The maximum PCs are therefore less than 1% of the respective CLoS.

For local conservation sites, the maximum NDep PC, predicted at E26 LWS ('CWP lake Pit 26') is predicted to be less than 100% of the CLo (Table 34). On this basis, the potential for these sites to be unduly impacted by rates of nutrient nitrogen deposition as a result of the Proposed Development is regarded as unlikely and the predicted impact **not significant**.

7.8 Annual mean acid deposition

Table 35 shows that the maximum rates of acid deposition are predicted at North Meadow & Clattinger Farm SAC (E21) (at 0.06% of the upper CLo); and at Wildmoorway Meadows SSSI (E6) at 0.2% of the CLo. The maximum PCs are therefore less than 1% of the upper CLoS.

For local conservation sites, the maximum acid deposition PC, predicted at E26 LWS ('CWP lake Pit 26') is predicted to be less than 100% of the CLo (Table 35).

The impact of acid deposition from the Proposed Development is therefore also regarded as **not significant**.

Table 30 Results at SAC and SSSI, long-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQAL	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PEC ($\mu\text{g}/\text{m}^3$)	PEC/AQAL (%)	Receptor	Significant?
NOx	30	Annual	mean	LT	0.06	0.2%	7.76	25.9%	E21 (SAC)	Not significant
SO ₂	20	Annual	mean	LT	0.01	0.1%	0.71	3.6%	E21 (SAC)	Not significant
SO ₂	10	Annual	mean	LT	0.01	0.1%	0.71	7.1%	E21 (SAC)	Not significant
NH ₃	3	Annual	mean	LT	0.003	0.1%	2.40	80.1%	E21 (SAC)	Not significant
NOx	30	Annual	mean	LT	0.17	0.6%	9.17	30.6%	E6 (SSSI)	Not significant
SO ₂	20	Annual	mean	LT	0.03	0.1%	0.93	4.6%	E6 (SSSI)	Not significant
SO ₂	10	Annual	mean	LT	0.03	0.3%	0.93	9.3%	E6 (SSSI)	Not significant
NH ₃	3	Annual	mean	LT	0.007	0.2%	2.307	76.9%	E6 (SSSI)	Not significant
Notes: *LT= long-term, ST = short-term; Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest										

Table 31 Results at SAC and SSSI, short-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQ	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PC/ Headroom (%)	Receptor	Significant?
NOx	75	24-hour	100 th percentile	ST	1.50	2.0%	2.6%	E20 (SAC)	Not significant
NOx	200	24-hour	mean	ST	2.46	1.2%	1.4%	E23 (SAC)	Not significant
NOx	75	24-hour	100 th percentile	ST	2.53	3.4%	4.3%	E19 (SSSI)	Not significant
NOx	200	24-hour	mean	ST	2.46	1.2%	1.4%	E23 (SSSI)	Not significant
Notes: *LT= long-term, ST = short-term; Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest									

Table 32 Results at NNR, LNR, LWS and AW - long-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQAL	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PEC ($\mu\text{g}/\text{m}^3$)	PEC/AQAL (%)	Receptor
NO _x	30	Annual	mean	LT	2.87	9.6%	12.8	43%	E27 (LWS)
SO ₂	20	Annual	mean	LT	0.51	2.5%	1.20	6.0%	E27 (LWS)
SO ₂	10	Annual	mean	LT	0.51	5.1%	1.20	12%	E27 (LWS)
NH ₃	1	Annual	mean	LT	0.15	15%	2.45	245%	E26 (LWS)
NH ₃	3	Annual	mean	LT	0.15	5%	2.45	82%	E26 (LWS)
Notes: *LT= long-term, ST = short-term. Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest									

Table 33 Results at NNR, LNR, LWS and AW - short-term AQAL

Pollutant	AQAL ($\mu\text{g}/\text{m}^3$)	Averaging time	Statistic	LT or ST AQAL	PC ($\mu\text{g}/\text{m}^3$)	PC/AQAL (%)	PC/ Headroom (%)	Receptor
NO _x	75	24-hour	100 th percentile	ST	31.4	42%	56.9%	E27 (LWS)
NO _x	200	24-hour	mean	ST	2.87	1.4%	1.6%	E27 (LWS)
Notes: *LT= long-term, ST = short-term. Data on each row are for one receptor, the receptor at which the percentage of PC/AQAL is greatest								

Table 34 Worst-case nitrogen deposition

Receptor	PC (kg/ha/y)	CLomin (ka/ha/y)	CLomax (ka/ha/y)	PC/CLomin (%)	PC/CLomax (%)	PEDR/CLomin (%)	PEDR/CLomax (%)	Receptor
SAC	0.02	20	30	0.12%	0.08%	101%	67%	E21 (SAC)
SSSI	0.05	20	30	0.26%	0.18%	96%	64%	E6 (SSSI)
AW/ LWS	1.65	10	20	16.5%	8.23%	359%	180%	E26 (LWS)
Notes: Data on each row are for one receptor, the receptor at which the percentage of PC/CLmin is greatest								

Table 35 Worst-case acid deposition

Receptor	PC	PC/CLo (%)	Background/CLo (%)	PEDR/CLo (%)	Receptor
SAC with respect to CLomax	0.0029	0.06%	34.7%	34.7%	E21 (SAC)
SSSI with respect to CLomax	0.0069	0.2%	35.0%	35.2%	E6 (SSSI)
AW, LWS with respect to CLomax	0.2315	2.1%	24.6%	26.7%	E26 (LWS)
Notes: Data on each row are for one receptor, the receptor at which the percentage of PC/CLo is greatest					

8. Mitigation Measures

8.1 Construction Dust

Recommended mitigation techniques as set out in IAQM guidance²⁵ to reduce the potential for dust soiling and health impacts during the construction phase of the Proposed Development for a low-risk site are outlined in Table 36.

These measures will inform the Construction Environment Management Plan (CEMP) for the site. All construction activities will be planned such that the requirements of the CEMP are taken into account and relevant mitigation measures will be implemented prior to works commencing, as required.

Table 36 Construction dust mitigation measures

Site application	Mitigation Measures
Communications	The name and contact details of person(s) accountable for air quality and dust issues will be displayed on the site boundary.
	Display the Construction Manager and/or regional office contact information.
Monitoring	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills if within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit.
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Site application	Mitigation Measures
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the Local Authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
Waste Management	No burning of waste materials.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Implement a wheel washing system to prevent mud being deposited on the highway. Before leaving the site vehicles will be inspected for heavy deposit's on their wheels if present the deposit's will be removed manually or with a power washer. Measures may include the installation of rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

9. Conclusion

Earthcare Technical Ltd (ETL) has evaluated the potential air quality impact associated with the proposed development of the AD plant, the 'Proposed Development', on agricultural land off Ashton Road, Ashton Keynes, Wiltshire.

The AD plant will treat feedstocks principally comprising crops and manures. The Proposed Development will enable the recovery of residual biogas generated from the digestion process for use in on-site CHP engines, that will provide on-site heat and electricity with the remainder upgraded to produce biomethane, that will be injected into the National Grid, and also carbon dioxide (CO₂) for distribution and use elsewhere. The process will also produce liquid and fibre digestate which will be transported to destination farms for use as biofertiliser to confer agricultural benefit.

The assessment considers the potential for the Proposed Development to adversely impact upon human health and ecological conservation sites within the locale. The evaluation, based on qualitative risk-based approach in addition to detailed atmospheric dispersion modelling using ADMS 5.2.2, assessed the magnitude and significance of any potential short and long-term effects in relation to the air quality standards set in legislation and relevant evaluation criteria provided in guidance.

In terms of sensitive receptors that may be affected by traffic impacts associated with the construction and operation of the Development, the level of the predicted increase in AADT flows of light and heavy-duty vehicles associated with construction or operation of the Development were not considered to require further detailed assessment in accordance with DMRB and IAQM criteria. On this basis the potential for impact may be regarded as insignificant.

For sensitive receptors affected by construction dust impacts from the Proposed Development, the potential for dust soiling/ health impacts impact as a result of deposition from the construction phase at these sensitive receptors is considered to be **not significant**. The potential for dust impact as a result of deposition from the construction phase at sensitive conservation areas was further determined to be **not significant**.

There are no sensitive receptor locations within relevant EA screening distance criteria of potential on-site bioaerosol sources associated with the Proposed Development. The potential for impact is therefore unlikely to be significant and a site-specific bioaerosol risk assessment is not required.

Based on a qualitative risk assessment approach, the potential for odour impact at nearby receptor locations was determined to be **not significant**.

For the modelling of long-term impacts, and as a conservative approach, the assessment has considered the continuous operation of combustion plant at the Proposed Development. The modelling presented herein is also pessimistic in other respects as: the assessment considers the maximum (worst-case) value at each receptor across all 15 model runs; it assumes the simultaneous operation of all plant including the CHP and emergency flare which is an extremely unlikely operating scenario as the role of the emergency flare is to consume biogas when the CHP is unable to do so.

Emissions from the proposed plant have been modelled based on either maximum MCPD emissions limit values, or the maximum limit values specified in the manufacturer's technical datasheets.

The magnitude of change, even when considering the conservative assessment approach, is determined to be negligible for long-term impacts of NO₂, TVOCs (as 10% benzene), H₂S, NH₃, and particulate matter (PM₁₀ and PM_{2.5}). In accordance with IAQM criteria, the predicted long-term impacts at receptors from the Proposed Development are therefore determined to be **not significant**.

The maximum the short-term NO₂, CO, TVOC, SO₂, NH₃, H₂S, and particulate matter (PM₁₀) impacts are predicted to be not significant in accordance in accordance with IAQM (2017) guidance and/or EA/Defra AERA (2023) guidance criteria.

As the relevant standards are not predicted to be exceeded at locations where the either the long-term or short-term objective applies, the potential for impacts from the operation of the Proposed Development at human receptor locations are considered to be **not significant**.

Within 10km of the Site there are 18 Site of Special Scientific Interest, including two corresponding areas also designated SACs, and several local conservation sites. Long-term air quality impacts of predicted concentrations at both the nationally and locally designated ecological conservation areas are determined as **not significant**.

The potential for impact on nationally and locally designated conservation sites as a result of nitrogen and acid deposition from the process is considered unlikely and therefore **not significant**.

It is considered that predicted air quality impacts are found not to be a constraint on the construction or operation of the Proposed Development.

Figures

Figure 1 Site location

Figure 2 Modelled point sources

Figure 3 Modelled volume sources

Figure 4 Windroses 2017-2021

Figure 5 Modelled buildings

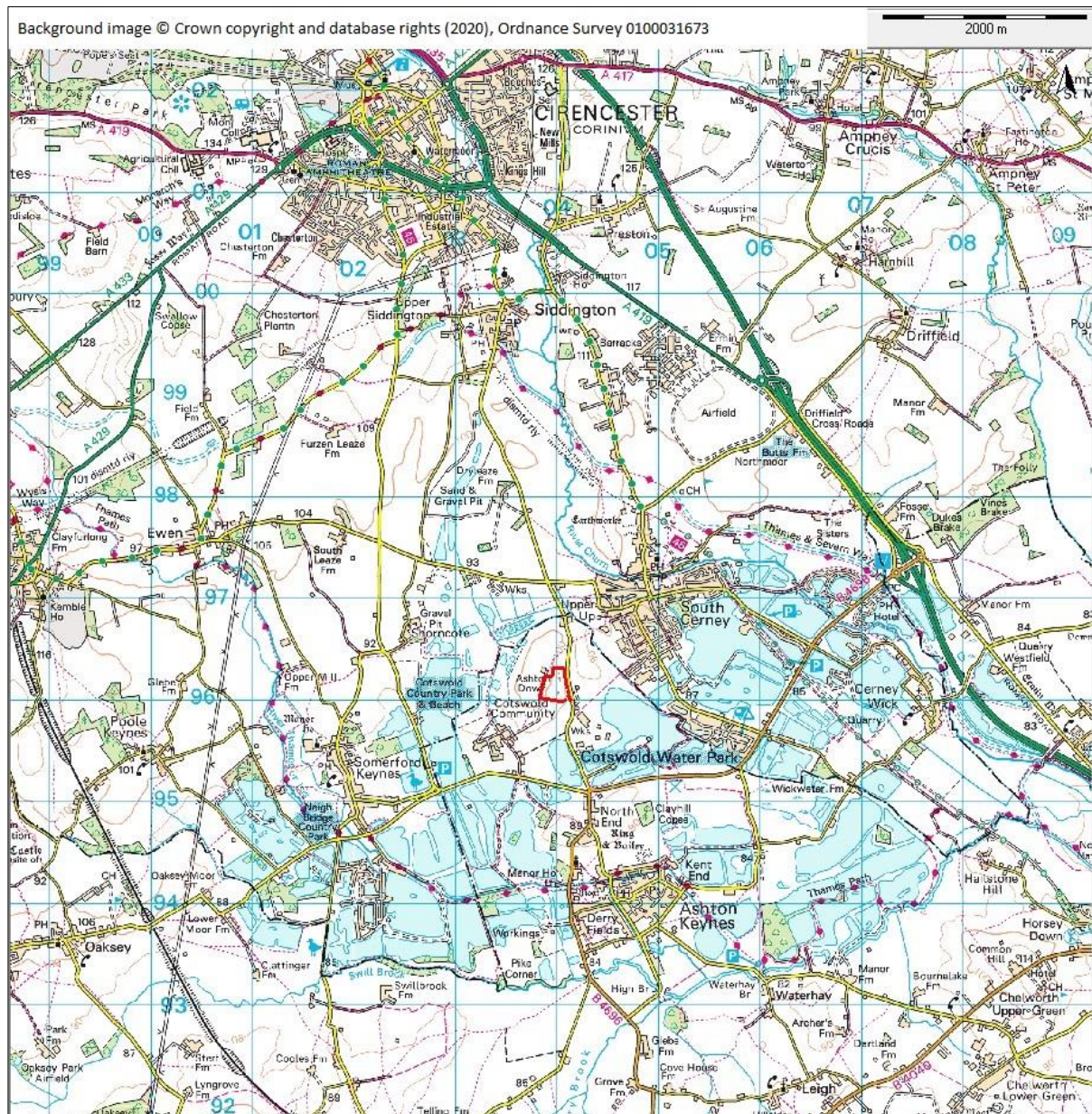
Figure 6 Terrain data

Figure 7 Human receptors within 2km

Figure 8 Ecological receptors within 2km

Figure 9 Ecological receptors within 10km

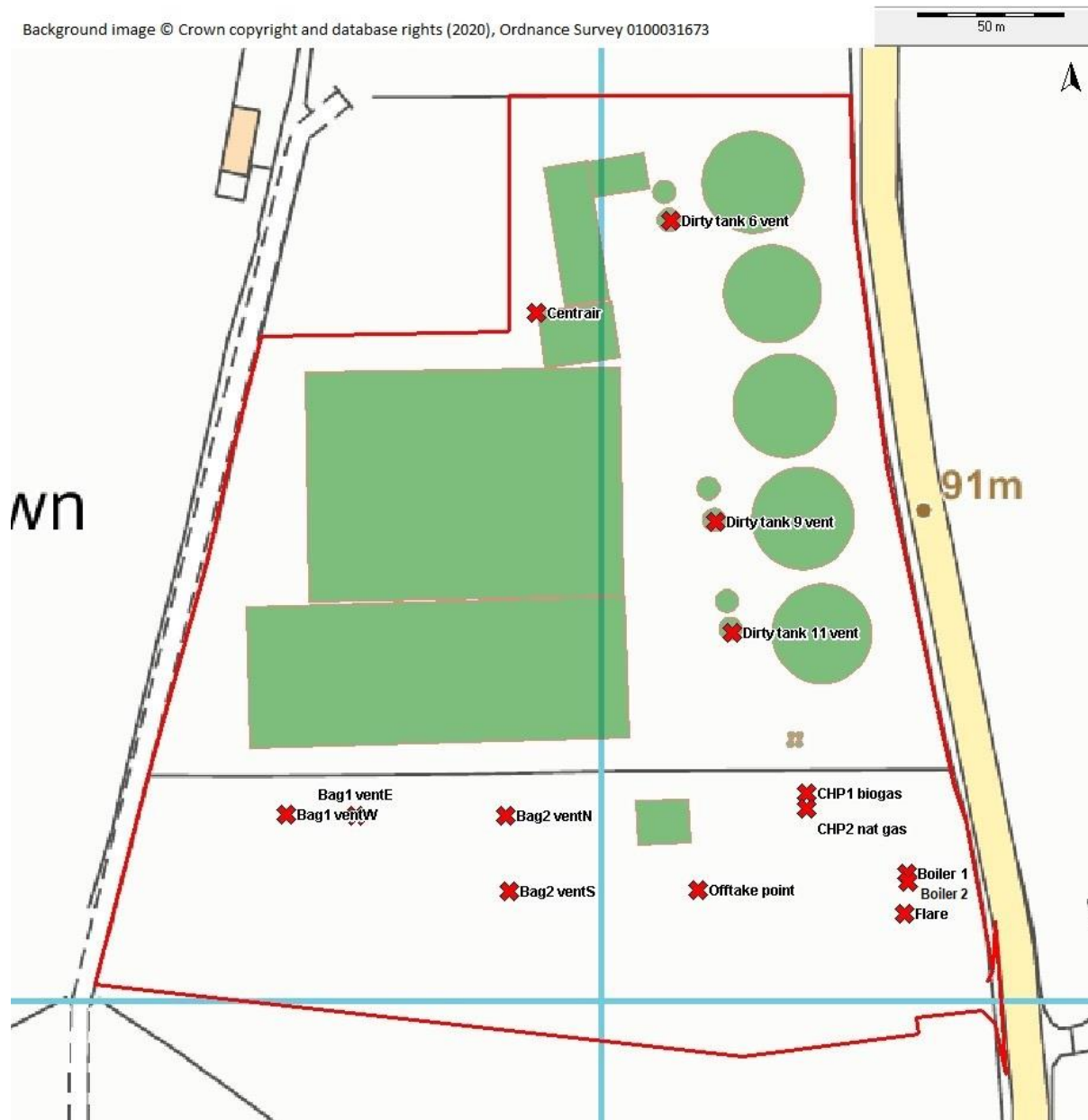
Figure 1 Site location



Legend



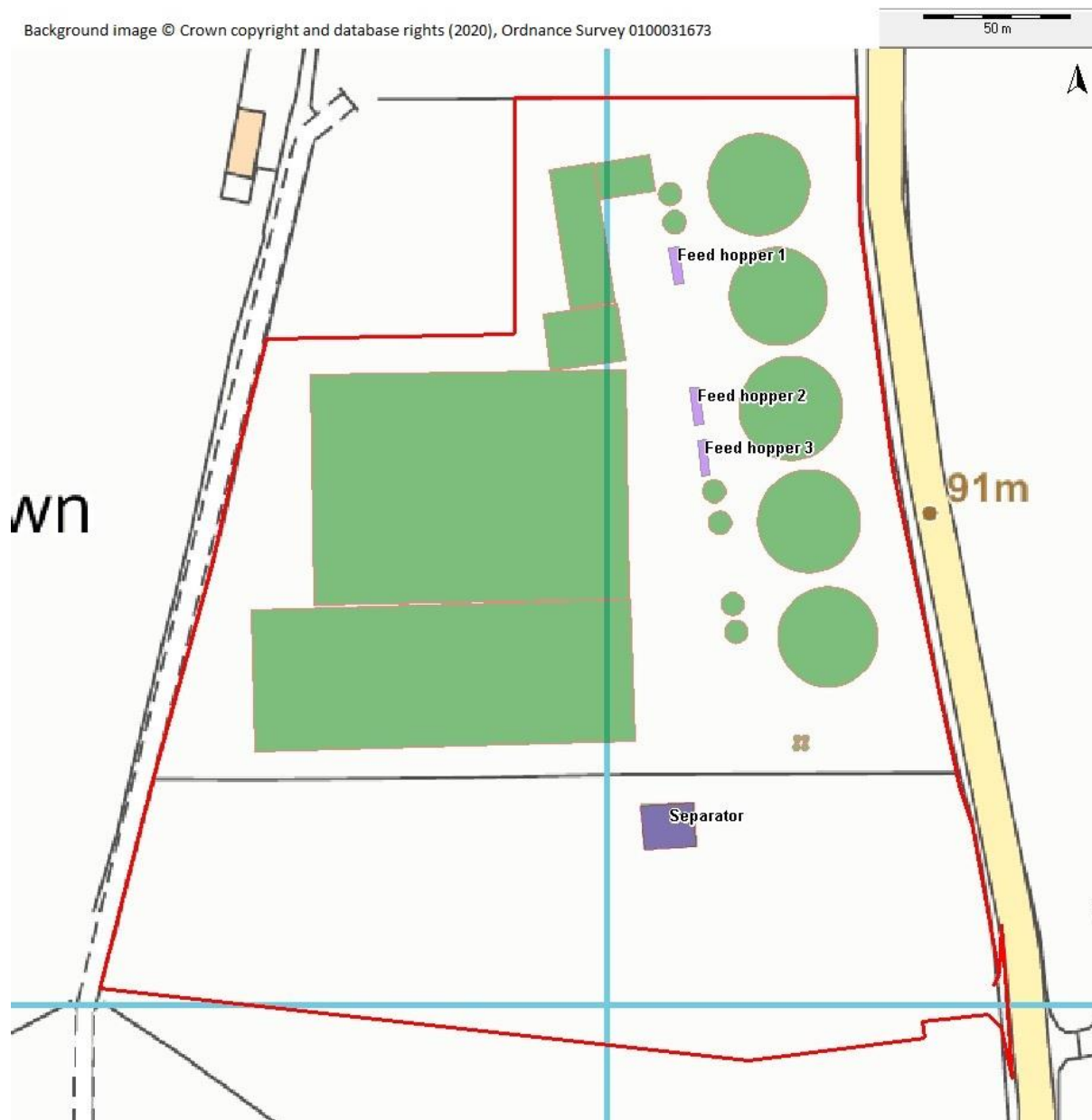
Figure 2 Modelled point sources



Legend

- ☒ Point sources (14)
- ☒ Boundary
- ☒ Buildings (17)

Figure 3 Modelled volume sources



Legend

- ☒ Volume sources (4)
- ☒ Boundary
- ☒ Buildings (17)

Figure 4 GFS meteorological data windroses 2017-2021

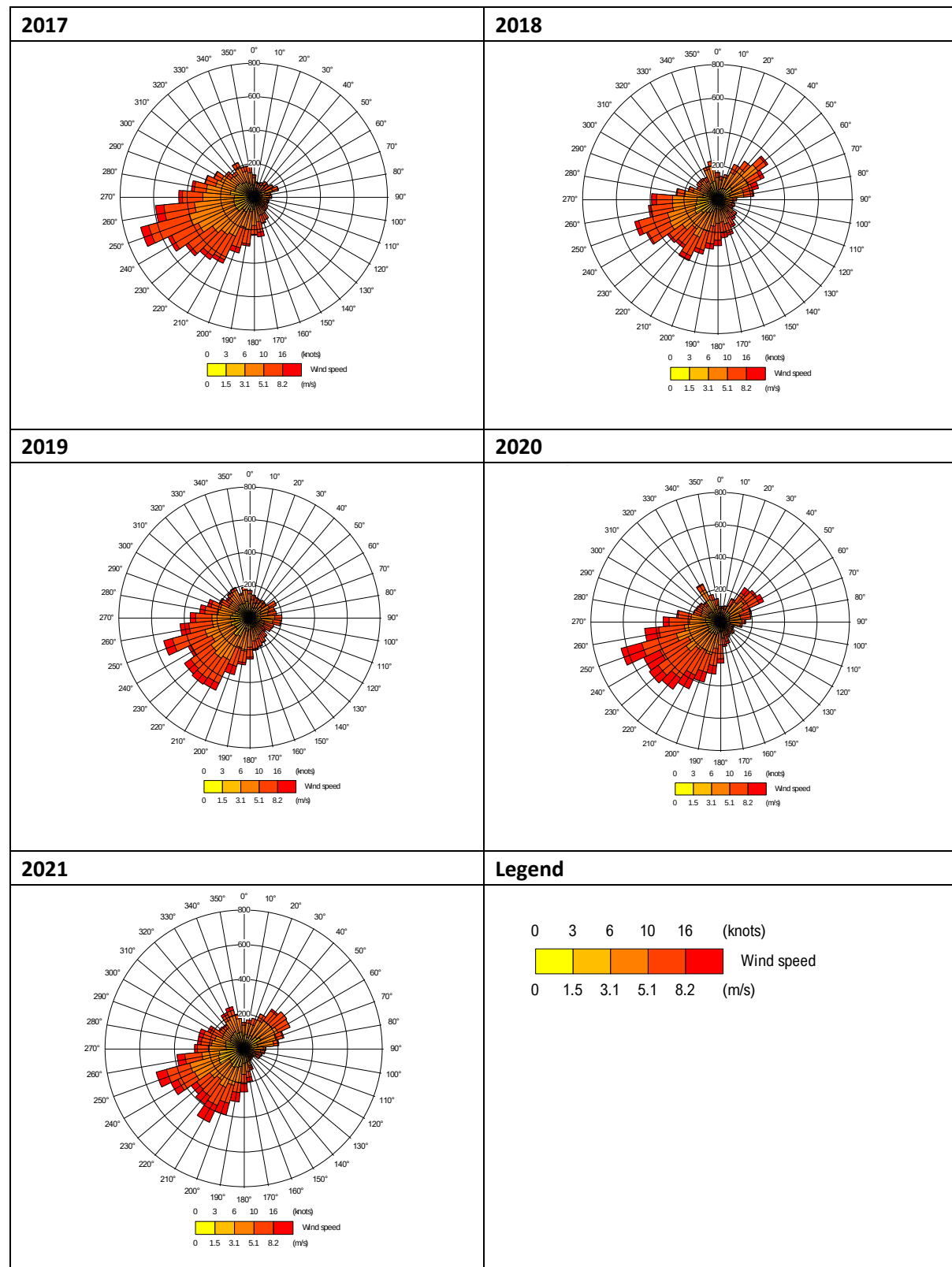
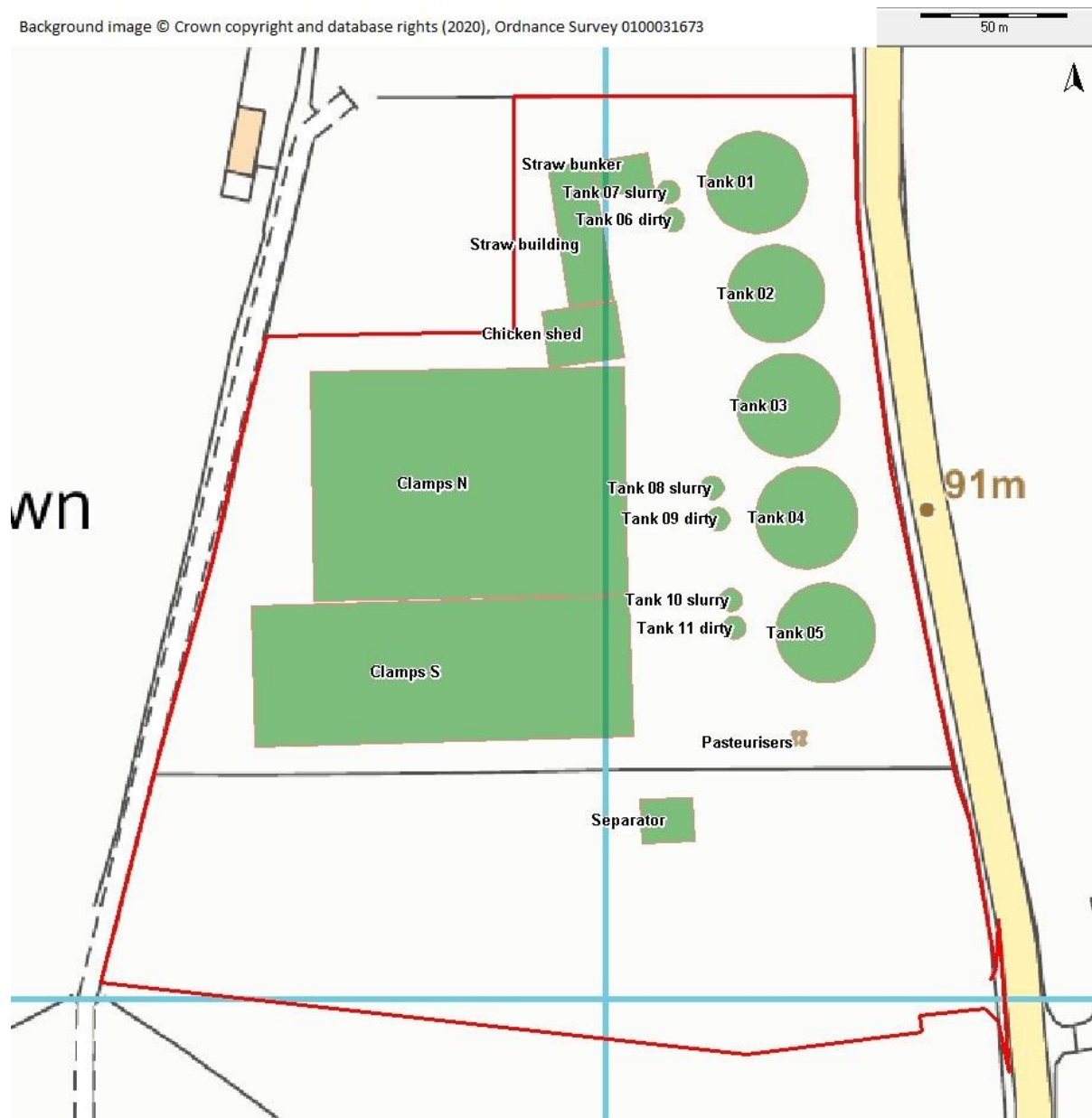


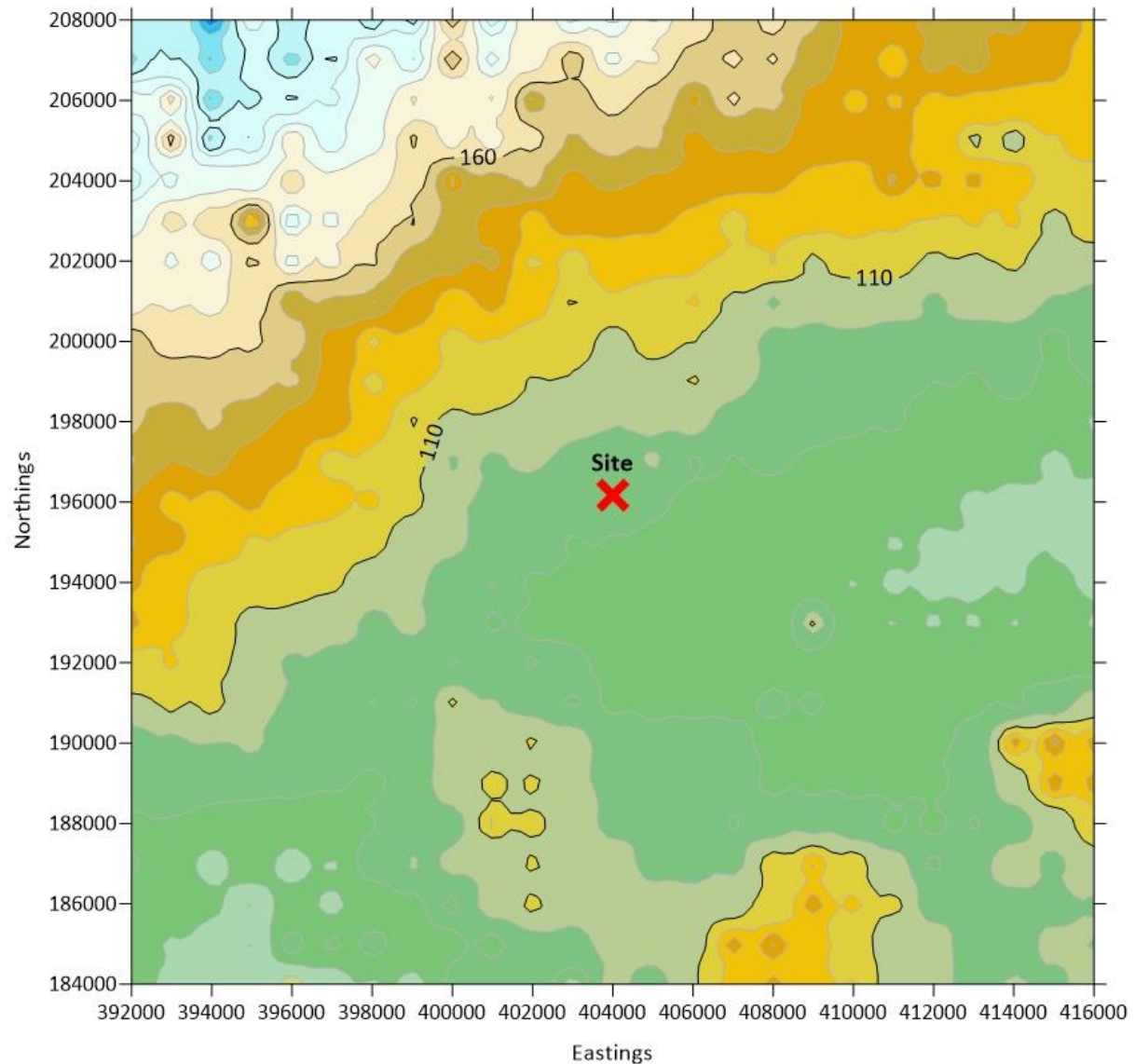
Figure 5 Modelled buildings



Legend

- ☒ Buildings (17)
- ☒ Boundary

Figure 6 Terrain data



Elevation (m)

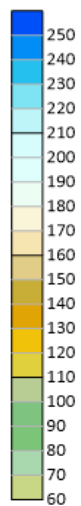


Figure 7 Human receptors within 2km

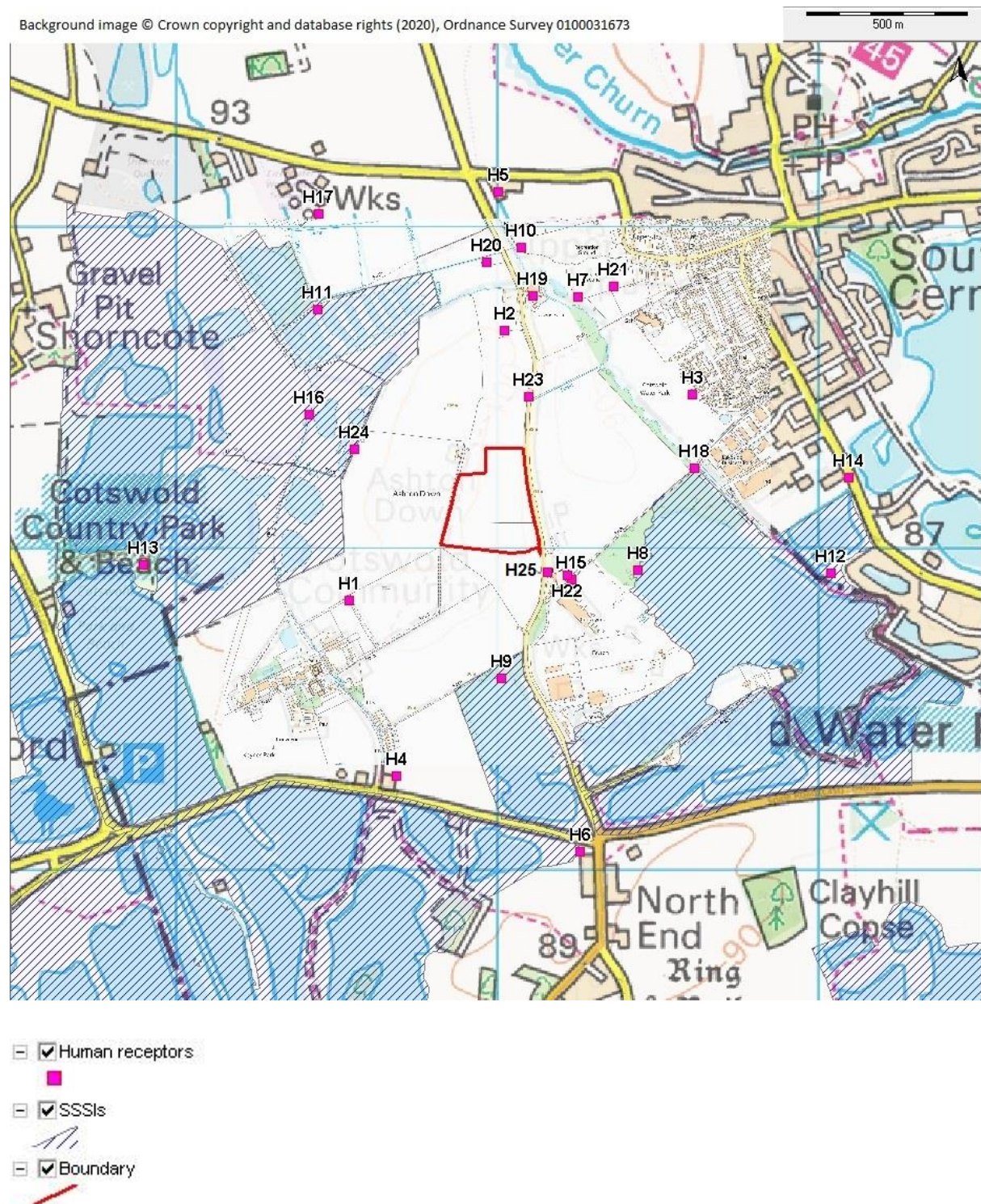
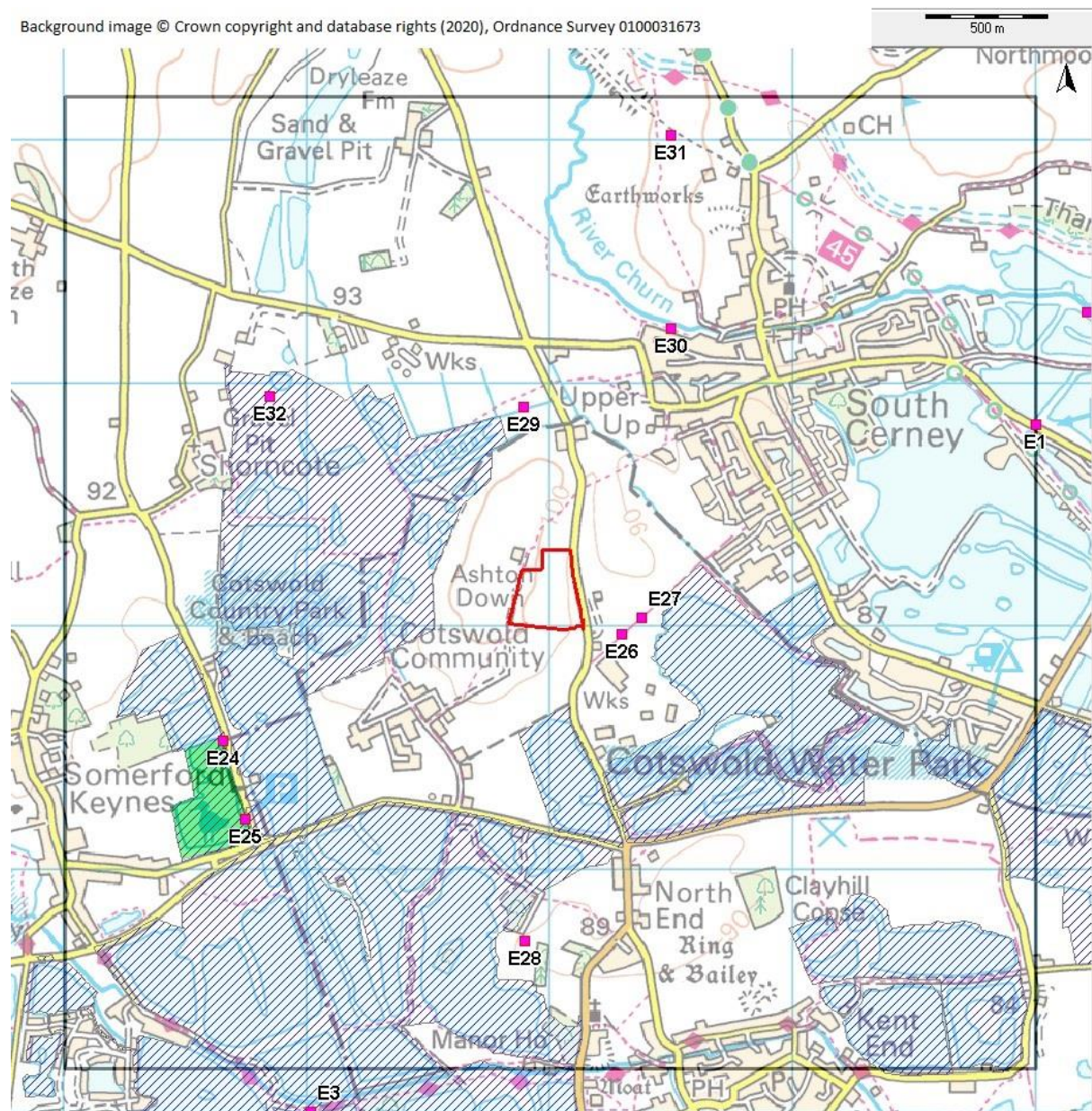


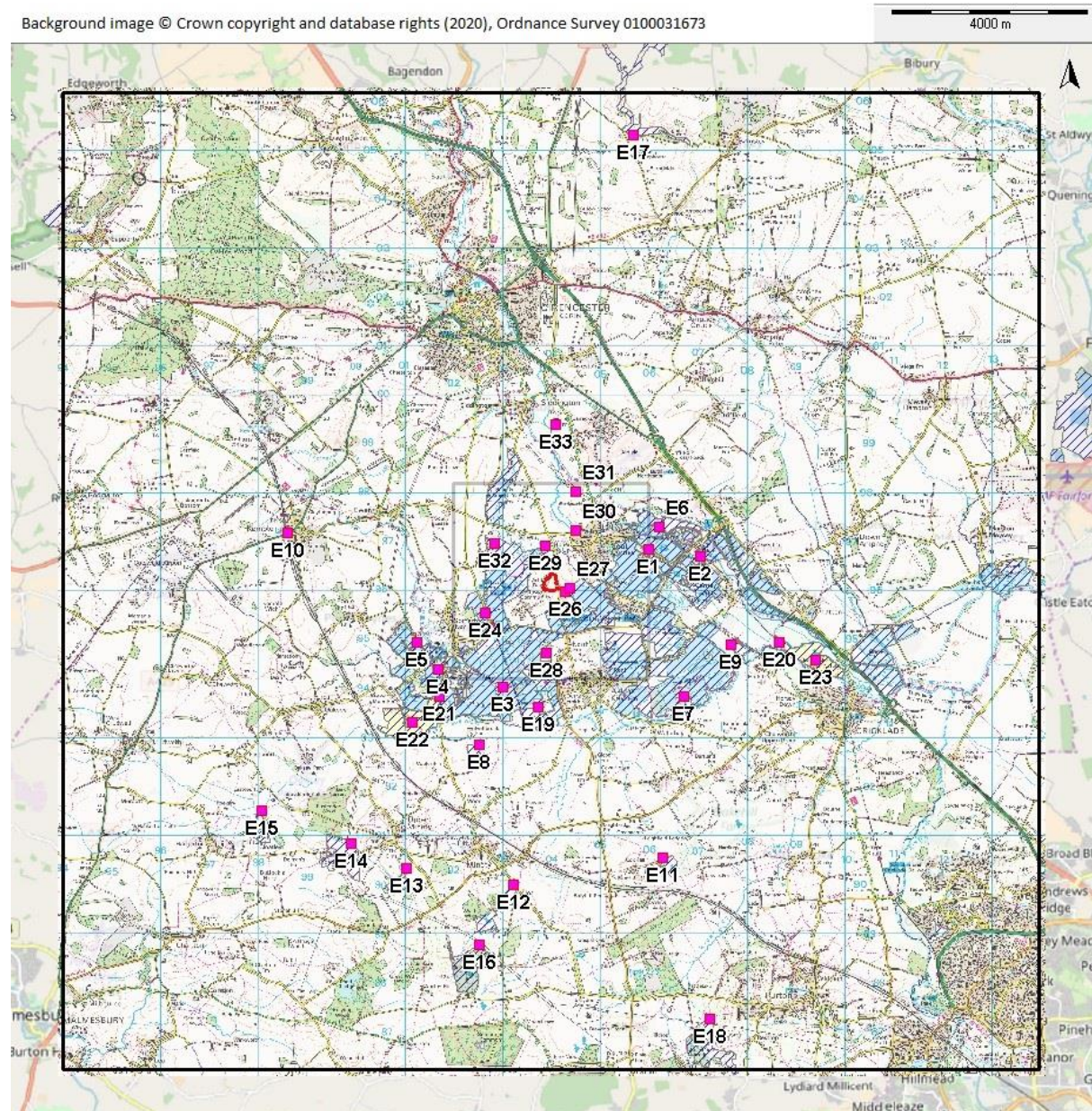
Figure 8 Ecological receptors within 2km



Legend

- ☒ Ecological receptors
- ☒ SSSIs
- ☒ LNR
- ☒ +/-2km
- ☒ Boundary

Figure 9 Ecological receptors within 10km

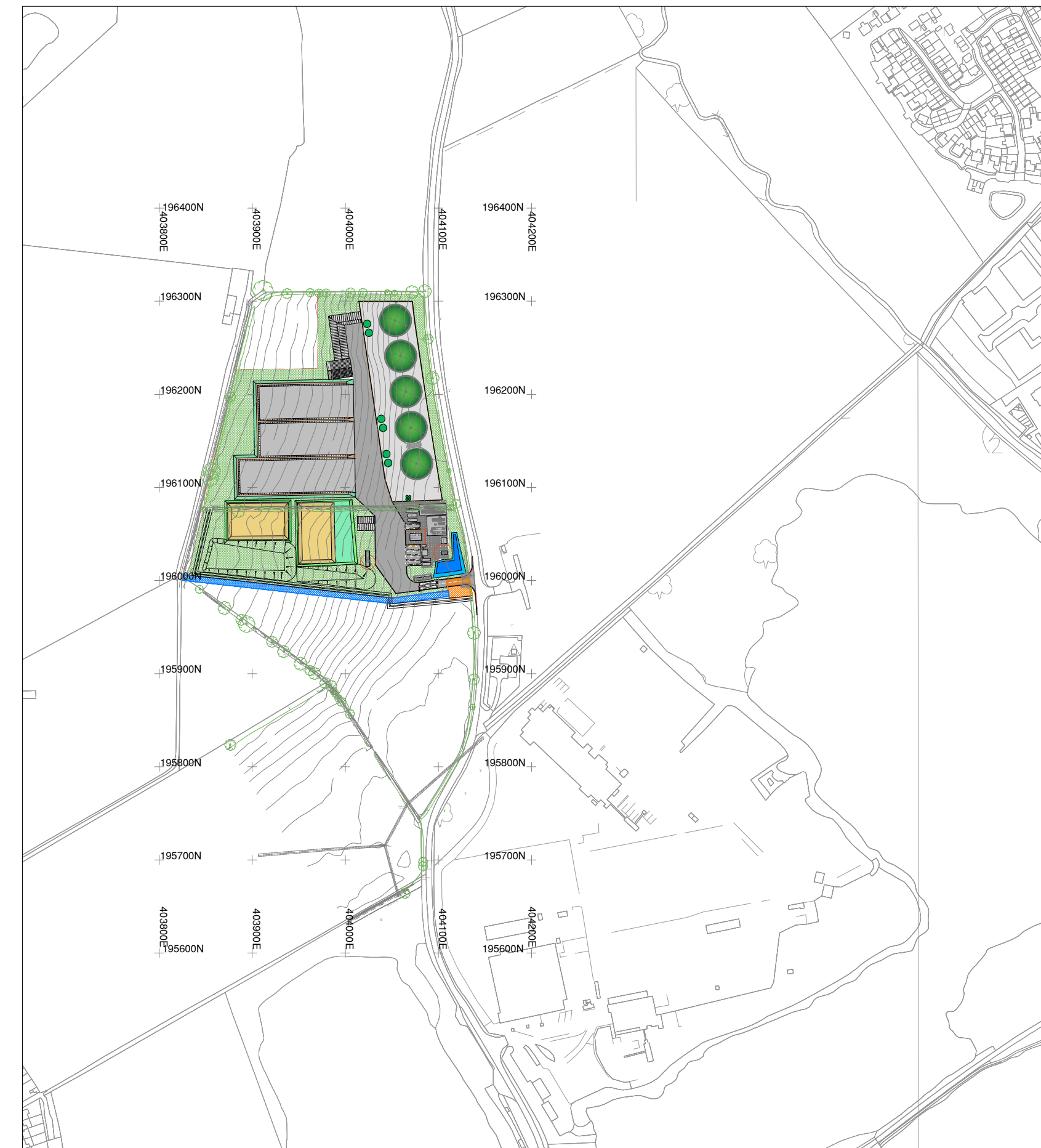
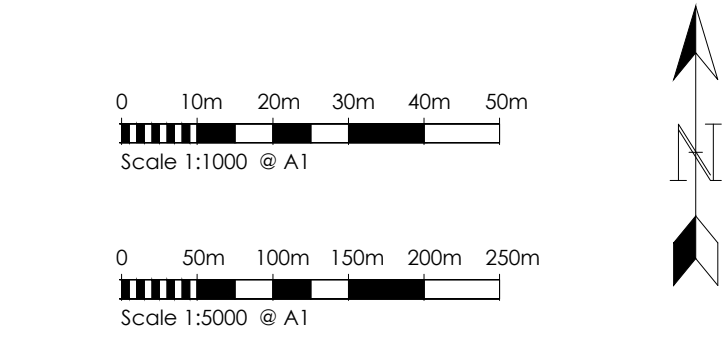


Legend

- ☒ Ecological receptors
- ☒ SSSIs
- ☒ SACs
- ☒ +/-2km
- ☒ +/-10km
- ☒ Boundary

Appendix A General Arrangement

General arrangement © GGP Consult; original is A1 size.



SITE LOCATION PLAN
Scale: 1:5000 @ A1



SITE PLAN
Scale: 1:1000 @ A1

NOT FOR CONSTRUCTION

NOTES:-

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Topographic survey
4. This drawing is to be read in conjunction with 29419/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Site Red Line Boundary (6.99Ha)

F	24/03/23	Issued For Approval	JHC	JHC
E	08/12/22	Hatched Plan	JHC	JHC
D	30/11/22	Layout update	JHC	JHC
C	02/11/22	Redline & Entrance Update	JHC	JHC
B	28/10/22	Redline Update	JHC	JHC
A	04/10/22	Concept Layout	JHC	JHC

Rev Date Description DR CH

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Job Title
AD Plant.
Ashton Keynes

Drawing Title
Site Layout Plan.

Status
Planning

Scale
As Noted @ A1

Date
Oct '22

Drawn By
J. Collins

Checked
JHC

Approved
JHC

Orig. No.
29419/P/101

Rev
F

Appendix B Dust Assessment Method

B.1 Dust Impact Assessment Method

The evaluation of construction dust impacts follows the methodology outlined in IAQM guidance, as summarised in Table 37.

Table 37 Dust impact assessment method

Stage	Method
Step 1	Initial screen to determine the requirement for a detailed assessment; required where a sensitive human receptor is located within 350m from the site boundary and/or within 100m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s). For ecological receptors assessment is required where a receptor is situated within 50m from the site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s).
Step 2	Assess the impacts of dust separately for earthworks, construction and trackout by: Step 2A - Determine dust magnitude based on scale and nature of the works. Step 2B - Determine the sensitivity of the area; and Step 2C - Combine 2A and 2B to give the risk of dust impacts.
Step 3	Determine site-specific mitigation for each of the activities defined in Step 2
Step 4	Examine residual effects and determine whether or not these are significant.
Step 5	Conclude dust assessment.

Source: IAQM Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Construction sites are classified according to the risk of effects, appropriate site-specific mitigation measures are identified, and the significance of effects is determined.

The assessment assumes no mitigation, except that required by legislation. This therefore defines the baseline against which the change in effect as a result of mitigation can be measured.

The significance of the dust effects is generally undertaken after applying the site-specific mitigation. This would take into account factors that might affect the risk of dust effects arising, even after any site-specific mitigation has been implemented.

B.2 Significance Criteria Appropriate to the Assessment - Dust

The framework for determining the significance of dust impacts from construction and demolition activities is published by IAQM. Based on the determination of the dust emission magnitude and sensitivity of the area, the risk of dust impacts from earthworks, construction and trackout can then be determined as set out in Table 38 to Table 42.

Table 38 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Source: IAQM Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Table 39 Sensitivity of the Area to Human Health Impacts

Receptor sensitivity	Annual mean PM ₁₀ concentration	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 – 10	High	Medium	Low	Low	Low
	28 – 32 µg/m ³	>100	High	High	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 – 10	High	Medium	Low	Low	Low
	24 – 28 µg/m ³	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	28 – 32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	24 – 28 µg/m ³	>10	Low	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low	Low
	<24 µg/m ³	>100	Low	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Source: IAQM Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Table 40 Risk of dust impacts - Earthworks

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Table 41 Risk of dust impacts - Construction

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Table 42 Risk of dust impacts - Trackout

Sensitivity of area	Dust emission magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Source: Holman et al (2016). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London.

Appendix C Odour Impact Assessment Method

C.1 Odour Impact Assessment Method

Table 43, summarised from IAQM guidance, provides criteria to assist with determining the risk factors for the odour source, pathway and receptor sensitivity.

Table 43 Risk factors for the odour source, pathway and receptor sensitivity

Source Odour Potential	Pathway Effectiveness	Receptor
Factors affecting source odour potential include: • magnitude of odour release • how odorous the compounds are • unpleasantness of the odour	Factors affecting odour transfer to receptor: • distance from source to receptor • frequency (%) of winds from source to receptor or, qualitatively, the direction of receptors • mitigation measures to reduce transfer • effectiveness of dispersion/dilution in reducing transfer • topography and terrain	Air quality practitioner to apply professional judgement to determine whether a receptor falls into one of the following categories:
Large Source Odour Potential	Highly Effective Pathway	High Sensitivity Receptor
Large-scale, odorous sources, odours unpleasant (-2) to very unpleasant (-4) hedonic tone, process classed as 'Most offensive' in H4 guidance, compounds with low odour thresholds (OTs), open air operation with no mitigation/ control.	Small separation distance/ receptor is adjacent to source, high frequency (%) of winds from source to receptor or, qualitatively, receptors downwind of source with respect to prevailing wind, open processes with low-level releases.	Users expect high level of amenity, people may be present continuously or for extended periods e.g., residences, hospitals, schools, tourist.
Medium Source Odour Potential	Moderately Effective Pathway	
Medium-scale, moderately odorous compounds, odours with neutral (0) to unpleasant (-2) hedonic tone, process classed as 'Moderately offensive' in H4 guidance, some mitigation in place but significant residual odour.	Receptor is local to the source, releases are elevated where mitigation relies on dispersion but compromised by building effects.	Users expect reasonable level of amenity, not present continuously or for extended periods e.g., places of work, commercial, recreational facilities.
Small Source Odour Potential	Ineffective Pathway	
Small-scale, mildly odorous compounds with high OTs, odours with neutral (0) to very pleasant (+4) hedonic tone, process classed as 'Less offensive' in H4 guidance, effective mitigation in place e.g., BAT, with little/ no residual odour.	Large separation distance/ receptor is remote from source, low frequency (%) of winds from source to receptor or, qualitatively, receptors upwind of source with respect to prevailing wind, where mitigation relies on dispersion, releases are high-level and not compromised by building effects.	Users would not reasonably expect a high-level of amenity, transient exposure/ present for limited periods only e.g., industrial, farms, footpaths and roads.

Source: Adapted from Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1, Institute of Air Quality Management, London.

Based on the risk factors in Table 43, the source odour potential is categorised as small, medium or large and the pollutant pathway from source to receptor categorised as ineffective, moderately effective or highly effective. The level of source odour potential risk and pathway effectiveness are then considered together to predict risk of odour exposure (impact) at each receptor location using the matrix in Table 44.

Table 44 Risk of odour exposure (impact) at the receptor location

		Source Odour Potential		
		Small	Medium	Large
Pathway Effectiveness	Highly effective	Low Risk	Medium Risk	High Risk
	Moderately effective	Negligible Risk	Low Risk	Medium Risk
	Ineffective	Negligible Risk	Negligible Risk	Low Risk

Source: Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1, Institute of Air Quality Management, London.

The next step is to estimate the effect of the odour impact at each receptor location, based on receptor sensitivity using the matrix in Table 45.

Table 45 Likely magnitude of odour effect at the specific receptor location

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

Source: Bull et al (2018). IAQM Guidance on the assessment of odour for planning – version 1.1, Institute of Air Quality Management, London.

The prediction of the likely odour effect at each sensitive receptor can then be determined.

Appendix D Model and Model Set-up

D.1 Meteorology and associated parameters

Hourly meteorological data

Computer modelling of dispersion requires hourly sequential meteorological data and to provide robust statistics, the record should be of a suitable length; preferably four years or longer. The meteorological data used in this study are obtained from assimilation and short-term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS),⁵³ for 2017-2021 inclusive for the vicinity of the Site. Figure 4 shows the windroses for the meteorological data supplied.

The prevailing wind directions are predominantly from the south southwest, southwest, west southwest and west. The data were used with the ADMS 5 calms option with the default settings and a minimum value of 0.01m/s was set for turbulent velocities. Table 46 shows the number of lines of usable data each year with and without calms option.

Defra's LAQM TG16 contains cautionary guidance on use of data with less than 85% usable data in calculating for comparison with short-term AQAL. The minimum value of usable data was far above this threshold.

Table 46 Meteorological station data and parameters

Year of data	Number of hours flagged initially as calm	Number of hours unusable (with the ADMS calms option selected)
2017	5	0
2018	10	0
2019	9	0
2020	12	0
2021	7	0

Notes: ¹Parameters are: wind speed, wind direction, near-ground air temperature, cloud cover

Meteorological parameters

The ADMS model uses various meteorological parameters to represent the area at the meteorological station and the location of the Site. The key parameters that have been defined are the surface roughness and minimum Monin-Obuhkov length which are defined at the site of the meteorological data measurement and the dispersion site (the Wider Site).

- Surface roughness: this is related to land-use and the height of obstacles on the ground which give rise to mechanically-generated turbulence; and
- Minimum Monin-Obuhkov length: this is used to model the extent to which the urban heat island effect limits the most stable atmospheric conditions. Heat released from the urban area prevents the atmospheric boundary layer becoming very stable.

⁵³ The GFS data used is derived from the high resolution operational GFS datasets, the data are not obtained from the lower resolution (0.5 degree) long-term archive.

Table 47 shows the values of the parameters that can be selected in the model from a drop-down menu. Other, intermediate, values can be entered directly. The values selected for the meteorological data site and the Wider Site are given in Table 48.

Table 47 ADMS 5 meteorological parameter values

Surface roughness		Minimum Monin-Obuhkov length	
Descriptor	Value (m)	Descriptor	Value (m)
Large urban areas	1.5	Large conurbations >1million	100m
Cities, woodland	1.0	Cities and large towns	30m
Parkland, open suburbia	0.5	Mixed urban/industrial	30m
Agricultural areas (max)	0.3	Rural areas (max) ¹	20m
Agricultural areas (min)	0.2	Small towns < 50,000	10m
Root crops	0.1	Rural areas (min) ¹	2m
Open grassland	0.02		
Short grass	0.005		
Sea	0.0001		

Notes: ¹ Not available from the ADMS drop-down menu

Table 48 Meteorological site and wide Site met parameters

Parameter	Meteorological data site	Wider Site
Surface roughness	0.2m	0.3m
Minimum Monin-Obuhkov length	2m	2m

D.2 Buildings

In ADMS, for each stack a 'main' building must be specified; for each source the nearest building was specified as the main buildings. Figure 5 shows the buildings modelled.

The presence of buildings close to an emission point can affect the dispersion from a source, bringing the plume centreline down towards the ground in the lee of a building and entraining pollutant into the cavity (or, recirculation) region in the lee of a building. In the cavity, concentrations are assumed to be uniform and it may be a region of high concentrations depending on the amount of pollutant entrained. The presence of buildings may increase or decrease concentrations at a location compared with the no buildings scenario.

ADMS allows up to 25 buildings to be included as input and the model combines the relevant input buildings into one effective building; the effective building is calculated for each line of meteorological data. Buildings can only be circular or rectangular in cross-section so the buildings entered are simplified geometries. Buildings less than one third of the height of the stack will be ignored by the ADMS 5 model. Smaller Site structures such as the CHP containers, have not been as their effect outside the Site will be limited compared with the larger digester structures.

Table 49 shows the (simplified) parameters of the buildings on site used as input to the model; they are shown in Figure 5.

In ADMS, for each stack a 'main' building must be specified; for each source the nearest building was specified as the main buildings. The clamps were specified as the main building for storage bags and

nearest dirty water tanks, the Separator Building was specified for the CHP, boilers, flare and off-take point.

Table 49 Modelled buildings

Building name	Building centre X	Building centre Y	Height (m)	Length/ Diameter (m)	Width (m)	Orientation (°)
Clamps N	403955	196176	13.8	108	78.5	89.0
Clamps S	403946	196112	13.8	130	48.5	88.5
Separator	404023	196061	9.96	15.0	18.0	178
Tank 01	404053	196279	8.77	35.1	35.1	0.00
Tank 02	404060	196241	8.77	33.6	33.6	0.00
Tank 03	404064	196203	8.77	35.4	35.4	0.00
Tank 04	404070	196164	8.77	35.1	35.1	0.00
Tank 05	404077	196125	8.77	34.2	34.2	0.00
Tank 07 dirty	404023	196276	11.5	8.00	8.00	0.00
Tank 06 dirty	404025	196266	11.5	8.00	8.00	0.00
Tank 08 pre	404038	196175	10.6	8.00	8.00	0.00
Tank 09 slurry	404040	196164	10.6	8.00	8.00	0.00
Tank 10 slurry	404044	196136	10.3	8.00	8.00	0.00
Tank 11 dirty	404046	196127	10.3	8.00	8.00	0.00
Chicken shed	403994	196227	14.2	25.9	19.4	82.0
straw building	403993	196262	13.0	47.9	15.5	351
straw bunker	404008	196282	12.9	19.1	12.5	81.0

Notes: Buildings with circular cross-section, such as the digesters, do not have a width and orientation specified

D.3 Terrain

The effect of terrain is not usually modelled when terrain gradients in the modelled domain are below the 1:10 threshold usually applied. However, when using numerical weather data it is recommended to consider the dispersion model predictions with and without terrain.

Table 50 Terrain domain and resolution

	Minimum	Maximum	Resolution (m)
X	392003	184174	95
Y	416003	208174	95
Z	59.8	250.9	n/a

D.4 Receptors

Human receptors

A relevant receptor is defined in Defra's LAQM TG16 as: 'A location representative of human (or ecological) exposure to a pollutant, over a time period relevant to the objective that is being assessed against, where the Air Quality Strategy objectives are considered to apply.'

For long-term AQAL the relevant receptors are residences (including care homes), schools and hospitals. For short-term AQAL additional receptors may also need to be considered: outdoor spaces such as balconies, gardens, leisure sites and public space where human populations may spend the relevant time period. As most short-term AQAL allow for a number of exceedances per annum, the human exposure may need to be repeated in order to be relevant. Workplaces are usually excluded from consideration as air quality in workplaces is covered by Health and Safety legislation.⁵⁴

Table 51 shows the locations and type of the receptors selected to be representative of the relevant human receptors. All the receptors have been modelled at a height of 1.5m, representative of inhalation height (nose level) at ground level. Their locations are shown in Figure 67.

Table 51 Human receptors

ID	Location	Type	NGR X	NGR Y	Approx. distance from Site boundary (m)	Direction from Site
H1	Costwold Community (residential cluster)	Residential	403543	195832	335	SW
H2	<10 residential properies	Residential	404026	196674	343	N
H3	South Cerney (Town)	Residential	404612	196476	555	ENE
H4	Residential Property	Residential	403689	195285	734	SSW
H5	Cross Roads Farm	Residential	404007	197106	799	N
H6	<10 residential properties along B4696	Residential	404264	195051	931	S
H7	Ann Edwards Church of England Primary School playing fields	Primary School	404257	196779	504	NNE
H8	Whitefriars Sailing Club	Leisure	404442	195928	305	ESE
H9	Lake 62 LPS Events (Watersports)	Leisure	404018	195591	392	S
H10	Bike Track	Leisure	404078	196933	626	N
H11	Bird hide	Leisure	403444	196740	676	NW
H12	Hoburne Cotswold Holiday Park	Leisure	405046	195917	907	ESE
H13	Children's climbing frames etc / playground	Leisure	402900	195944	932	W
H14	South Cerney Angling Club	Leisure	405102	196215	984	E
H15	Aggregate Industries	Industrial	404236	195900	120	SE
H16	Sand and Gravel works	Industrial	403419	196414	501	WNW
H17	Cirencester WwTW	Industrial	403448	197038	898	NNW
H18	Industrial / Trading Estate	Commercial / Industrial	404621	196245	526	E
H19	3No. commercial units	Commercial	404114	196781	477	N

⁵⁴ Health and Safety Executive EH40/2005 Workplace Exposure Limits (Fourth Edition 2020)

H20	Storage yard	Commercial	403973	196887	580	N
H21	Allotments Gardens	Allotments	404368	196813	582	NNE
H22	Footpath	Footpath	404222	195913	101	SE
H23	Footpath	Footpath	404103	196467	163	N
H24	Footpath	Footpath	403560	196305	333	W
H25	Telephone Exchange	Industrial	404160	195922	80	SE

Notes: All modelled at a height of 1.5m.

Ecological receptors

Ecological receptors were placed in the designated areas at the nearest locations to the Site. Table 52 shows conservation sites identified within the specified distance, (2km for SSSIs, AW, LWS, NNR, LNR and 10km for SPAs, SACs) which have been modelled. In addition, SSSIs between 2km and 10km from the Site have been considered. All the ecological receptors have been modelled at a height of 1.5m. The ecological receptors are illustrated in Figure 8 and Figure 9.

Table 52 Ecological receptors

ID	Site name	Designation	NGR X	NGR Y	Approx. distance from boundary (m)
E1	Cotswold Water Park (SSSI) 1	SSSI	406003	196823	1,988
E2	Cotswold Water Park (SSSI) 2	SSSI	407065	196670	2,998
E3	Cotswold Water Park (SSSI) 3	SSSI	403015	193996	2,169
E4	Cotswold Water Park (SSSI) 4	SSSI	401680	194373	2,699
E5	Cotswold Water Park (SSSI) 5	SSSI	401253	194919	2,796
E6	Wildmoorway Meadows SSSI	SSSI	406213	197288	2,345
E7	Upper Waterhay Meadow SSSI	SSSI	406726	193802	3,376
E8	Acres Farm Meadow SSSI	SSSI	402529	192813	3,448
E9	Elmlea Meadows SSSI	SSSI	407686	194870	3,713
E10	Kemble Railway Cuttings SSSI	SSSI	398600	197163	5,356
E11	Stoke Common Meadows SSSI	SSSI	406293	190521	5,862
E12	Distillery Farm Meadows SSSI	SSSI	403231	189947	6,088
E13	Emmett Hill Meadows SSSI	SSSI	401041	190298	6,353
E14	Cloatley Farm SSSI	SSSI	399905	190807	6,514
E15	Cloatley Manor Farm Meadows SSSI	SSSI	398070	191482	7,324
E16	Ravensroost Wood SSSI	SSSI	402535	188732	7,388
E17	Barnsley Warren SSSI	SSSI	405688	205304	9,141
E18	Restrop Farm & Brockhurst Wood SSSI	SSSI	407250	187215	9,294
E19	Pike Corner SSSI LWS	SSSI LWS	403748	193600	2,400
E20	North Meadow and Clattinger Farm SAC, North Meadow Cricklade SSSI, North Meadow Cricklade NNR	SAC SSSI NNR	408670	194922	4,650
E21	North Meadow & Clattinger Farm SAC, Clattinger Farm SSSI	SAC SSSI	401709	193810	3,052
E22	North Meadow & Clattinger Farm SAC, Clattinger Farm SSSI	SAC SSSI	401167	193282	3,809

ID	Site name	Designation	NGR X	NGR Y	Approx. distance from boundary (m)
E23	North Meadow and Clattinger Farm SAC, North Meadow Cricklade SSSI, North Meadow Cricklade NNR	SAC SSSI NNR	409423	194570	5,466
E24	Cokes Pit LNR Lake 34 LWS (1)	LNR	402654	195522	1,271
E25	Cokes Pit LNR Lake 34 LWS (2)	LNR	402743	195200	1,353
E26	LWS (CWP lake Pit 26), Priority Habitat	LWS PH	404297	195960	156
E27	LWS (CWP lake Pit 26), Priority Habitat	LWS PH	404380	196032	243
E28	LWS (CWP lake Pits 28, 28a, 29, 30, 35, 38)	LWS	403899	194697	1,293
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS;	LWS	403891	196896	594
E30	River Churn LWS	LWS	404499	197220	1,005
E31	South Cerney Railway Cutting	LWS RIGS	404498	198013	1,757
E32	Shorncote Quarry RIGS	LWS RIGS	402847	196939	1,258
E33	Siddington Copse	AW	404090	199375	3,068`
Notes: LWS = Local Wildlife Site; SAC = Special Area of Conservation; SSSI – Special Site of Scientific Interest; NNR = National Nature Reserve; LNR= Local Nature Reserve; RIGS = Regionally Important Geological Site; PH = Priority Habitat. n/a: note applicable.					

Table 53 Ecological receptors – sensitivity and relevant Critical Load class

ID	Site	Designation	Condition/ Comments	Acidity Critical Load Class	Lichens or bryophytes?	Cle (µg/m³)	Relevant Nitrogen Critical Load Class	CLO (kgN/ha/yr)
E1 - E5	Cotswold Water Park	SSSI	Favourable. A large series of former and current gravel workings which host large numbers of breeding and non-breeding birds. Populations of stoneworts.[1]	No sensitive habitat or species listed in APIS	/	n/a	No features in APIS	n/a
E6	Wildmoorway Meadows	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E7	Upper Waterhay Meadow	SSSI	Unfavourable Recovering	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E8	Acres Farm Meadow	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E9	Elmlea Meadows	SSSI	Unfavourable Declining	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E10	Kemble Railway Cuttings	SSSI	/	No sensitive habitat or species at this site		/	No sensitive habitat or species at this site	/
E11	Stoke Common Meadows	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E12	Distillery Farm Meadows	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E13	Emmett Hill Meadows	SSSI	Favourable	Acid grassland	Yes	1	Non-Mediterranean dry acid and neutral closed grassland	10 - 15
E14	Cloatley Farm	SSSI	Unfavourable Declining	Acid grassland	No	3	Non-Mediterranean dry acid and neutral closed grassland	10 - 15
E15	Cloatley Manor Farm Meadows	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30

ID	Site	Designation	Condition/ Comments	Acidity Critical Load Class	Lichens or bryophytes?	CLe (µg/m³)	Relevant Nitrogen Critical Load Class	CLo (kgN/ha/yr)
E16	Ravensroost Wood	SSSI	Favourable	Unmanaged Broadleaved/Coniferous Woodland	Yes	1	Meso- and eutrophic Quercus woodland	15 - 20
E17	Barnsley Warren	SSSI	Favourable	Calcareous grassland (using base cation)	No	1 - 3	Sub-Atlantic semi-dry calcareous grassland	15 - 25
E18	Restrop Farm & Brockhurst Wood	SSSI	Favourable	Unmanaged Broadleaved/ Coniferous Woodland	Yes	1	Meso- and eutrophic Quercus woodland	15 - 20
E19	Pike Corner	SSSI LWS	Unfavourable Recovering	Calcareous grassland (using base cation)	No	1 - 3	Sub-Atlantic semi-dry calcareous grassland	15 – 25
E20 - E23	North Meadow and Clattinger Farm	SAC	n/a	Acid grassland	No	3	Low and medium altitude hay meadows	15 - 25
E21, E22	Clattinger Farm	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E20, E23	North Meadow Cricklade	SSSI	Favourable	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E20 - E23	North Meadow Cricklade	NNR	n/a	Acid grassland	No	3	Low and medium altitude hay meadows	20 - 30
E24, E25	Cokes Pit Lake 34	LNR, LWS	Includes open water, shingle islands, reedswamp, grassland and hedgerows.[2]	Acid grassland	No	1 - 3	Alpine and subalpine grasslands	5 - 10
E26 - E27	Cotswold Water Park Lake Pit 26	LWS	Main habitat: Standing open water. Priority Habitats - Lowland mixed deciduous woodland [1]	Unmanaged Broadleaved/Coniferous Woodland	No	1 - 3	Broadleaved/Coniferous unmanaged woodland	10 - 20
E28	Cotswold Water Park Lake Pits 28, 28a, 29, 30, 35, 38	LWS	Main habitat: Standing open water - no comparable habitat in APIS. Priority Habitats - lowland mixed deciduous woodland.	Broadleaved deciduous woodland	No	1 - 3	Broadleaved/Coniferous unmanaged woodland	10 - 20

ID	Site	Designation	Condition/ Comments	Acidity Critical Load Class	Lichens or bryophytes?	CLe ($\mu\text{g}/\text{m}^3$)	Relevant Nitrogen Critical Load Class	CLo ($\text{kgN}/\text{ha}/\text{yr}$)
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS	LWS	All lakes, gravel pits & reservoirs >0.25ha with reedbed and bird assemblages.[2]	Acid grassland	No	1 - 3	Mountain hay meadows	10 - 20
E30	River Churn LWS	LWS	Mammal interest.[2]	Rivers and streams. No comparable habitat in APIS.	/	/	/	/
E31	South Cerney Railway Cutting	LWS RIGS	Geological interest. No further information provided by GCER.	/	/	/	/	/
E32	Shorncote Quarry	RIGS	RIGS (Exposures of the Upper Thames 1st terrace gravel/sands)	/	/	/	/	/
E33	Siddington Copse	AW	Ancient Replanted Woodland	Broadleaved/Coniferous unmanaged woodland	No	1 - 3	Broadleaved deciduous woodland	10 - 20
Notes: [1] Data supplied by Wiltshire and Swindon Biological Records Centre, Statutory Sites, Cotswold Water Park - Main Habitat (November 2022). [2] Data provided by Gloucestershire Centre for Environmental Records (November 2022). [3] Cotswold Lakes Trust Water Park Nature Reserves (https://waterpark.org/things-to-do/nature-reserves/)								

D.5 Post-processing

Use of background data

Considering long-term AQAL, it is a straightforward matter to add the annual mean contribution from the source, (annual mean PC) to the annual mean background concentration to predict the total concentration (annual mean PEC).

For comparison with short-term AQAL the addition of background is not so straightforward. The ADMS model allows for the calculation of percentiles from hourly background and process concentrations but hourly background concentrations are not commonly available, and not for all pollutants. The approach used was that described in the Defra permit guidance.

‘When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration.’

This has been used for all for short-term AQAL for averaging times for 15 minutes to 24 hours.

Conversion of NO_x to NO₂

The ADMS model includes a NO_x chemistry model, but the conversion of primary NO_x emissions to NO₂ is usually undertaken as a post-processing step for industrial permitting applications. For primary NO₂ to NO_x ratios of 10% or less, which is likely to be the case for the stack emissions, the Environment Agency and Natural Resources Wales⁵⁵ recommend use of the following conversion ratios:

- 35% for short term assessment
- 70% for long term assessment

These ratios have been used in this assessment.

Conversion of TVOC to benzene

Emissions are specified as TVOC for which there are no AQAL. There is an AQAL for benzene, one component of TVOC. An AEA Technology report on the Speciation of UK emissions of non-methane volatile organic compounds (2002)¹ reported on a series of VOC species profiles available for stationary combustion sources, covering a range of both fuel types and scale of combustion. The benzene fraction in industrial and commercial combustion of natural gas was reported to be less than 10%, therefore the TVOC concentrations (from combustion sources) at receptors has been modelled as 10% benzene.

⁵⁵ <https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment#nosubxsub-to-nosub2sub-conversion-ratios-to-use>

Deposition to ecological receptors

The ADMS model includes the ability to calculate the deposition flux rate (deposition) of pollutants, but the Environment Agency recommends deposition be calculated as a post-processing step in order to give conservative estimates of both ground level concentration and deposition, by assuming no loss of pollutant from air concentration to ground deposition.

Deposition may be 'dry' or 'wet'. Dry deposition of gases occurs due to diffusive motions and removal at surfaces, primarily the ground. It is characterised by a deposition velocity that depends on the pollutant and the nature of the surface.

Table 54 gives the deposition velocities for grassland and forest for the pollutants included in this assessment which are the values recommended by AQTAG 06. The values for grassland, which are lower than those for forest, have been used to represent deposition at all receptors.

Wet deposition occurs when precipitation washes pollutants out of the air. Some pollutants have a low solubility, and in addition, wet deposition is considered to be of limited importance close to the source. Wet deposition has not been included.

Table 54 Dry deposition velocities

Pollutant	Deposition velocity (m/s)	
	Grassland	Forest
NO ₂	0.0015	0.003
SO ₂	0.012	0.024
NH ₃	0.020	0.030

Deposition ($\mu\text{g}/\text{m}^2/\text{s}$) is calculated by multiplying the near ground air concentration ($\mu\text{g}/\text{m}^3$) by deposition velocity. Ecological receptors are sensitive to deposition of nitrogen (nutrient nitrogen) and to deposition of acid species including nitrogen (N), sulphur (S) and HCl. To convert from deposition of a pollutant to deposition of a species, the conversion factors given in Table 55 were used.

Nutrient nitrogen deposition is calculated as the total deposition of N in kg/ha/year, due to NO₂ and NH₃. To convert from deposition of N or S deposited to equivalent acidification units, a measure of how acidifying the chemical species can be, (keq/ha/year), the conversion factors given in Table 56 were used. Acid deposition is calculated taking into account the acidifying nitrogen and sulphur deposition, both expressed as keq/ha/year.

Table 55 Conversion factors for deposition of species N, S

Pollutant	Species deposited	Conversion factor from deposition of pollutant ($\mu\text{g}/\text{m}^2/\text{s}$) to deposition of species (kg/ha/year)
NO ₂	N	96
SO ₂	S	157.7
NH ₃	N	259.7

Table 56 Conversion factors for deposition of species deposition to acid equivalent

Species	Conversion factor from deposition of species (kg/ha/year) to deposition of equivalent acidification units (keq/ha/year)
N	0.071428
S	0.0625

Appendix E Results of sensitivity tests

E.1 Sensitivity Analysis

Sensitivity of the impacts to three parameters have been investigated, these are:

1. Year of meteorological data: 2017, 2018, 2019, 2020, 2021
2. Building effects: comparison of results with and without building effects for each year of meteorological data
3. Terrain effects: comparison of results with and without terrain effects (with building effects in both cases for each year of meteorological data).

For each of the 15 models runs the maximum value at the relevant receptors (human or ecological) for each pollutant-statistic combination was calculated. The results are presented in Table 57.

The predicted maximum was divided by (normalised) the AQAL value, or if the AQAL is expressed as a number of exceedances of threshold value, by the threshold value. These normalised values have been expressed as a percentage and are shown in Table 58.

Whilst the variation between test results was generally not significant, the addition of buildings and terrain produced the more conservative result at both human and ecological receptor locations in most cases. The inclusion of terrain resulted in an increase in predicted long term and short-term NH₃ concentrations for at human and ecological receptors.

This sensitivity assessment has demonstrated the percentage change in results due to use of different model options. The results presented in this report at the specified receptors are the maximum at each receptor across the 15 model runs and therefore represent the worst-case scenario results.

Table 57 Sensitivity tests

Model	Sensitivity test	Flat/Buildings/Terrain model options	Meteorological data year	z0d (m)	Minimum Lmod (m)
Model A	A	Flat	2017	0.3	2
	B	Flat	2018	0.3	2
	C	Flat	2019	0.3	2
	D	Flat	2020	0.3	2
	E	Flat	2021	0.3	2
	F	Flat & buildings	2017	0.3	2
	G	Flat & buildings	2018	0.3	2
	H	Flat & buildings	2019	0.3	2
	I	Flat & buildings	2020	0.3	2
	J	Flat & buildings	2021	0.3	2
Model B	K	Terrain & buildings	2017	0.3	2
	L	Terrain & buildings	2018	0.3	2
	M	Terrain & buildings	2019	0.3	2
	N	Terrain & buildings	2020	0.3	2
	O	Terrain & buildings	2021	0.3	2
Notes: Model A – heights of buildings and emission sources adjusted relative to m AOD Model B – no adjustment to building or emission source height					

Table 58 Sensitivity test results

Receptor type	Pollutant	Critical Level ($\mu\text{g}/\text{m}^3$)			Model A	Model A	Model B	Max
			Lower	Upper	Flat	Buildings	Terrain	
					Test A - E	Test F - J	Test K - O	
Human	CO Max rolling 8hr	10,000			1.67%	1.78%	1.64%	1.78%
	H ₂ S LT	140			0.001%	0.001%	0.002%	0.002%
	H ₂ S ST 24hr	150			0.001%	0.001%	0.002%	0.002%
	NH ₃ LT	180			0.06%	0.05%	0.12%	0.12%
	NH ₃ P100 1hr	2,500			0.17%	0.20%	1.50%	1.50%
	NO _x 99.79 1hr	200			9.24%	10.1%	9.73%	10.1%
	NO _x LT	40			4.76%	6.15%	5.17%	6.15%
	PM ₁₀ 90.41 24hr	50			0.43%	0.49%	0.66%	0.66%
	SO ₂ 99.18 24hr	125			5.34%	5.09%	4.93%	5.34%
	SO ₂ 99.73 15m	350			3.02%	3.45%	2.80%	3.45%
	SO ₂ 99.9 1hr	266			4.56%	7.28%	4.91%	7.28%
	VOC 24hr	30			1.91%	2.63%	2.17%	2.63%
	VOC LT	5			11.5%	15.7%	13.0%	15.7%
Ecological	NH ₃ LT		1		7.10%	7.26%	14.8%	14.8%
	NH ₃ LT			3	2.37%	2.42%	4.92%	4.92%
	NO _x LT		30		8.52%	9.58%	8.69%	9.58%
	NO _x P100 24hr		75		34.4%	41.9%	31.6%	41.9%
	NO _x 24hr			200	1.28%	1.44%	1.30%	1.44%

Appendix F Human receptor results

Table 59 Long-term and short-term results NO₂

ID	Receptors	Comparison with annual mean AQAL: 40µg/m ³				Comparison with 99.79 th percentile 1-hour threshold 200µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	PC (µg/m ³)	PC/AQS (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	0.46	1.2%	10.4	26%	5.33	3%	180	3%
H2	<10 Residential properties	0.40	1.0%	10.3	26%	4.99	2%	180	3%
H3	South Cerney (Town)	0.77	1.9%	10.7	27%	4.74	2%	180	3%
H4	Residential property	0.21	0.5%	10.1	25%	3.29	2%	180	2%
H5	Cross Roads Farm	0.18	0.5%	10.1	25%	3.12	2%	180	2%
H6	<10 residential properties (along B4696)	0.16	0.4%	10.1	25%	3.00	1%	180	2%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	4.81	2%	180	3%
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	15.8	8%	180	9%
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	9.98	5%	180	6%
H10	Bike track	n/a	n/a	n/a	n/a	4.29	2%	180	2%
H11	Bird hide	n/a	n/a	n/a	n/a	6.37	3%	180	4%
H12	Hoburne Cotswold Holiday Park	0.32	0.8%	10.2	26%	5.04	3%	180	3%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	3.09	2%	180	2%
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	4.12	2%	180	2%
H15	Aggregate Industries	n/a	n/a	n/a	n/a	17.5	9%	180	10%
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	8.98	4%	180	5%
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	3.73	2%	180	2%
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	7.03	4%	180	4%
H19	3No. commercial units	n/a	n/a	n/a	n/a	5.98	3%	180	3%
H20	Storage yard	n/a	n/a	n/a	n/a	3.86	2%	180	2%
H21	Allotments gardens	n/a	n/a	n/a	n/a	4.01	2%	180	2%
H22	Footpath	n/a	n/a	n/a	n/a	17.7	9%	180	10%
H23	Footpath	n/a	n/a	n/a	n/a	9.94	5%	180	6%
H24	Footpath	n/a	n/a	n/a	n/a	9.92	5%	180	6%
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	20.3	10%	180	11%
Notes: Shaded entries denote locations of non-relevant exposure									

Table 60 Long-term and short-term results, PM₁₀

ID	Receptors	Comparison with annual mean AQAL: 40µg/m ³				Comparison with 90.41 st percentile 24-hour threshold: 50µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	0.03	0.06%	13.1	33%	0.10	0.2%	23.8	0.4%
H2	<10 Residential properties	0.03	0.08%	13.5	34%	0.12	0.2%	23.1	0.5%
H3	South Cerney (Town)	0.04	0.09%	13.5	34%	0.10	0.2%	23.1	0.4%
H4	Residential property	0.01	0.03%	13.1	33%	0.04	0.1%	23.8	0.2%
H5	Cross Roads Farm	0.01	0.03%	12.6	31%	0.04	0.1%	24.9	0.2%
H6	<10 residential properties (along B4696)	0.01	0.02%	14.0	35%	0.03	0.1%	22.0	0.1%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	0.10	0.2%	23.1	0.4%
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	0.09	0.2%	22.0	0.4%
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	0.07	0.1%	22.0	0.3%
H10	Bike track	n/a	n/a	n/a	n/a	0.06	0.1%	23.1	0.3%
H11	Bird hide	n/a	n/a	n/a	n/a	0.04	0.1%	23.0	0.2%
H12	Hoburne Cotswold Holiday Park	0.01	0.03%	13.3	33%	0.04	0.1%	23.5	0.2%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	0.03	0.1%	24.2	0.1%
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	0.04	0.1%	23.9	0.2%
H15	Aggregate Industries	n/a	n/a	n/a	n/a	0.11	0.2%	22.0	0.5%
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	0.06	0.1%	23.0	0.3%
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	0.02	0.0%	22.9	0.1%
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	0.09	0.2%	23.1	0.4%
H19	3No. commercial units	n/a	n/a	n/a	n/a	0.09	0.2%	23.1	0.4%
H20	Storage yard	n/a	n/a	n/a	n/a	0.06	0.1%	23.0	0.3%
H21	Allotments gardens	n/a	n/a	n/a	n/a	0.08	0.2%	23.1	0.4%
H22	Footpath	n/a	n/a	n/a	n/a	0.12	0.2%	22.0	0.5%
H23	Footpath	n/a	n/a	n/a	n/a	0.33	0.7%	23.1	1.4%
H24	Footpath	n/a	n/a	n/a	n/a	0.12	0.2%	23.0	0.5%
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	0.15	0.3%	22.0	0.7%
Notes: Shaded entries denote locations of non-relevant exposure									

Table 61 Long-term results, PM_{2.5}

ID	Receptors	Comparison with annual mean AQAL: 20µg/m ³				Comparison with 2040 target: 10µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	PC (µg/m ³)	PC/AALS (%)	PEC (µg/m ³)	PEC/AQS (%)
H1	Cotswold Community Residences	0.03	0.13%	8.37	42%	0.03	0.1%	8.37	84%
H2	<10 Residential properties	0.03	0.17%	8.68	43%	0.03	0.2%	8.68	87%
H3	South Cerney (Town)	0.04	0.18%	8.69	43%	0.04	0.2%	8.69	87%
H4	Residential property	0.01	0.05%	8.36	42%	0.01	0.1%	8.36	84%
H5	Cross Roads Farm	0.01	0.06%	8.35	42%	0.01	0.1%	8.35	83%
H6	<10 residential properties (along B4696)	0.01	0.04%	9.53	48%	0.01	0.0%	9.53	95%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H10	Bike track	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H11	Bird hide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H12	Hoburne Cotswold Holiday Park	0.01	0.06%	8.53	43%	0.01	0.1%	8.53	85%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H15	Aggregate Industries	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H19	3No. commercial units	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H20	Storage yard	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H21	Allotments gardens	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H22	Footpath	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H23	Footpath	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H24	Footpath	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Notes: Shaded entries denote locations of non-relevant exposure									

Table 62 Short-term results, 15-minute and 1-hour, SO₂

ID	Receptors	Comparison with 99.9 th percentile 15-min threshold: 266µg/m ³				Comparison with 99.73 rd percentile 1-hour threshold: 350µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)	PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	5.35	2.0%	261	2.0%	3.02	0.9%	345	0.9%
H2	<10 Residential properties	4.25	1.6%	260	1.6%	2.89	0.8%	344	0.8%
H3	South Cerney (Town)	4.37	1.6%	260	1.7%	2.62	0.7%	344	0.8%
H4	Residential property	3.26	1.2%	261	1.2%	1.68	0.5%	345	0.5%
H5	Cross Roads Farm	3.05	1.1%	262	1.2%	1.57	0.4%	346	0.5%
H6	<10 residential properties (along B4696)	3.24	1.2%	261	1.2%	1.68	0.5%	345	0.5%
H7	Primary School playing fields	4.90	1.8%	260	1.9%	2.64	0.8%	344	0.8%
H8	Whitefriars Sailing Club	16.6	6.2%	261	6.4%	9.42	2.7%	345	2.7%
H9	Lake 62 LPS Events (Watersports)	9.27	3.5%	261	3.5%	4.56	1.3%	345	1.3%
H10	Bike track	4.44	1.7%	260	1.7%	2.11	0.6%	344	0.6%
H11	Bird hide	8.39	3.2%	262	3.2%	3.78	1.1%	346	1.1%
H12	Hoburne Cotswold Holiday Park	6.57	2.5%	262	2.5%	3.13	0.9%	346	0.9%
H13	Recreation/ playground	2.96	1.1%	262	1.1%	1.55	0.4%	346	0.4%
H14	South Cerney Angling Club	4.82	1.8%	261	1.8%	2.36	0.7%	345	0.7%
H15	Aggregate Industries	18.9	7.1%	261	7.2%	11.9	3.4%	345	3.4%
H16	Sand and Gravel works	10.5	4.0%	262	4.0%	4.73	1.4%	346	1.4%
H17	Cirencester WwTW	5.55	2.1%	262	2.1%	2.29	0.7%	346	0.7%
H18	Industrial / Trading Estate	7.40	2.8%	260	2.8%	4.14	1.2%	344	1.2%
H19	3No. commercial units	6.96	2.6%	260	2.7%	2.86	0.8%	344	0.8%
H20	Storage yard	3.40	1.3%	262	1.3%	2.06	0.6%	346	0.6%
H21	Allotments gardens	3.63	1.4%	260	1.4%	2.15	0.6%	344	0.6%
H22	Footpath	19.4	7.3%	261	7.4%	12.1	3.5%	345	3.5%
H23	Footpath	10.6	4.0%	260	4.1%	4.95	1.4%	344	1.4%
H24	Footpath	13.9	5.2%	262	5.3%	5.57	1.6%	346	1.6%
H25	Telephone Exchange Building	15.2	5.7%	261	5.8%	10.7	3.0%	345	3.1%

Table 63 Short-term results, 24-hours, SO₂

ID	Receptors	Comparison with annual mean AQAL: 125 µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	1.58	1.3%	120	1.3%
H2	<10 Residential properties	1.11	0.9%	119	0.9%
H3	South Cerney (Town)	0.99	0.8%	119	0.8%
H4	Residential property	0.74	0.6%	120	0.6%
H5	Cross Roads Farm	0.53	0.4%	121	0.4%
H6	<10 residential properties (along B4696)	0.61	0.5%	120	0.5%
H7	Primary School playing fields	0.89	0.7%	119	0.7%
H8	Whitefriars Sailing Club	2.51	2.0%	120	2.1%
H9	Lake 62 LPS Events (Watersports)	1.43	1.1%	120	1.2%
H10	Bike track	0.69	0.6%	119	0.6%
H11	Bird hide	1.06	0.8%	121	0.9%
H12	Hoburne Cotswold Holiday Park	0.70	0.6%	121	0.6%
H13	Recreation/ playground	0.51	0.4%	121	0.4%
H14	South Cerney Angling Club	0.70	0.6%	120	0.6%
H15	Aggregate Industries	3.98	3.2%	120	3.3%
H16	Sand and Gravel works	1.18	0.9%	121	1.0%
H17	Cirencester WwTW	0.66	0.5%	121	0.5%
H18	Industrial / Trading Estate	1.44	1.2%	119	1.2%
H19	3No. commercial units	0.91	0.7%	119	0.8%
H20	Storage yard	0.72	0.6%	121	0.6%
H21	Allotments gardens	0.76	0.6%	119	0.6%
H22	Footpath	4.57	3.7%	120	3.8%
H23	Footpath	1.93	1.5%	119	1.6%
H24	Footpath	1.37	1.1%	121	1.1%
H25	Telephone Exchange Building	6.68	5.3%	120	5.5%

Table 64 Short-term results, CO

ID	Receptors	Comparison with maximum 8-hour running AQAL: 10,000µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	52.2	0.5%	9,798	0.5%
H2	<10 Residential properties	44.4	0.4%	9,794	0.5%
H3	South Cerney (Town)	44.6	0.4%	9,794	0.5%
H4	Residential property	34.5	0.3%	9,798	0.4%
H5	Cross Roads Farm	26.7	0.3%	9,803	0.3%
H6	<10 residential properties (along B4696)	29.9	0.3%	9,794	0.3%
H7	Primary School playing fields	48.4	0.5%	9,794	0.5%
H8	Whitefriars Sailing Club	171	1.7%	9,794	1.7%
H9	Lake 62 LPS Events (Watersports)	146	1.5%	9,794	1.5%
H10	Bike track	41.9	0.4%	9,794	0.4%
H11	Bird hide	67.9	0.7%	9,800	0.7%
H12	Hoburne Cotswold Holiday Park	44.7	0.4%	9,790	0.5%
H13	Recreation/ playground	30.3	0.3%	9,800	0.3%
H14	South Cerney Angling Club	45.8	0.5%	9,791	0.5%
H15	Aggregate Industries	174	1.7%	9,794	1.8%
H16	Sand and Gravel works	83.0	0.8%	9,800	0.8%
H17	Cirencester WwTW	31.1	0.3%	9,801	0.3%
H18	Industrial / Trading Estate	63.9	0.6%	9,794	0.7%
H19	3No. commercial units	60.4	0.6%	9,794	0.6%
H20	Storage yard	39.8	0.4%	9,800	0.4%
H21	Allotments gardens	36.9	0.4%	9,794	0.4%
H22	Footpath	178	1.8%	9,794	1.8%
H23	Footpath	96.5	1.0%	9,794	1.0%
H24	Footpath	89.3	0.9%	9,800	0.9%
H25	Telephone Exchange Building	167	1.7%	9,794	1.7%

Table 65 Long-term and short-term results, NH₃

ID	Receptors	Comparison with annual mean AQAL: 180µg/m ³				Comparison with maximum hourly AQS: 2,500µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	0.07	0.04%	2.37	1.32%	7.48	0.30%	2,495	0.3%
H2	<10 Residential properties	0.05	0.03%	2.35	1.30%	7.60	0.30%	2,495	0.3%
H3	South Cerney (Town)	0.05	0.03%	2.35	1.31%	4.48	0.18%	2,495	0.2%
H4	Residential property	0.02	0.01%	2.32	1.29%	3.00	0.12%	2,495	0.1%
H5	Cross Roads Farm	0.02	0.01%	2.32	1.29%	3.05	0.12%	2,495	0.1%
H6	<10 residential properties (along B4696)	0.02	0.01%	2.32	1.29%	2.22	0.09%	2,495	0.1%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	5.25	0.21%	2,495	0.2%
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	12.4	0.49%	2,495	0.5%
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	6.16	0.25%	2,495	0.2%
H10	Bike track	n/a	n/a	n/a	n/a	3.97	0.16%	2,495	0.2%
H11	Bird hide	n/a	n/a	n/a	n/a	3.74	0.15%	2,495	0.1%
H12	Hoburne Cotswold Holiday Park	0.02	0.01%	2.26	1.26%	2.70	0.11%	2,496	0.1%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	3.18	0.13%	2,495	0.1%
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	2.68	0.11%	2,496	0.1%
H15	Aggregate Industries	n/a	n/a	n/a	n/a	25.0	1.00%	2,495	1.0%
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	7.57	0.30%	2,495	0.3%
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	2.72	0.11%	2,495	0.1%
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	7.16	0.29%	2,495	0.3%
H19	3No. commercial units	n/a	n/a	n/a	n/a	5.76	0.23%	2,495	0.2%
H20	Storage yard	n/a	n/a	n/a	n/a	4.38	0.18%	2,495	0.2%
H21	Allotments gardens	n/a	n/a	n/a	n/a	4.24	0.17%	2,495	0.2%
H22	Footpath	n/a	n/a	n/a	n/a	27.9	1.11%	2,495	1.1%
H23	Footpath	n/a	n/a	n/a	n/a	16.0	0.64%	2,495	0.6%
H24	Footpath	n/a	n/a	n/a	n/a	13.7	0.55%	2,495	0.5%
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	37.5	1.50%	2,495	1.5%
Notes: Shaded entries denote locations of non-relevant exposure									

Table 66 Long-term and short-term results, TVOC as 10% Benzene

ID	Receptors	Comparison with annual mean AQAL: 5µg/m³				Comparison with 24-hour Mean AQS: 30µg/m³			
		PC (µg/m³)	PC/AQAL (%)	PEC (µg/m³)	PEC/AQAL (%)	PC (µg/m³)	PC/AQAL (%)	Headroom (µg/m³)	PC/Headroom (%)
H1	Cotswold Community Residences	0.17	3.3%	0.34	6.8%	0.17	0.6%	29.7	0.6%
H2	<10 Residential properties	0.14	2.9%	0.33	6.5%	0.14	0.5%	29.6	0.5%
H3	South Cerney (Town)	0.27	5.5%	0.46	9.1%	0.27	0.9%	29.6	0.9%
H4	Residential property	0.08	1.5%	0.25	5.0%	0.08	0.3%	29.7	0.3%
H5	Cross Roads Farm	0.07	1.3%	0.23	4.6%	0.07	0.2%	29.7	0.2%
H6	<10 residential properties (along B4696)	0.05	1.1%	0.24	4.7%	0.05	0.2%	29.6	0.2%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	0.15	0.5%	29.6	0.5%
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	0.35	1.2%	29.6	1.2%
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	0.16	0.5%	29.6	0.5%
H10	Bike track	n/a	n/a	n/a	n/a	0.09	0.3%	29.6	0.3%
H11	Bird hide	n/a	n/a	n/a	n/a	0.06	0.2%	29.7	0.2%
H12	Hoburne Cotswold Holiday Park	0.11	2.2%	0.30	6.1%	0.11	0.4%	29.6	0.4%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	0.04	0.1%	29.7	0.1%
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	0.13	0.4%	29.6	0.5%
H15	Aggregate Industries	n/a	n/a	n/a	n/a	0.51	1.7%	29.6	1.7%
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	0.08	0.3%	29.7	0.3%
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	0.05	0.2%	29.7	0.2%
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	0.38	1.3%	29.6	1.3%
H19	3No. commercial units	n/a	n/a	n/a	n/a	0.13	0.4%	29.6	0.4%
H20	Storage yard	n/a	n/a	n/a	n/a	0.09	0.3%	29.7	0.3%
H21	Allotments gardens	n/a	n/a	n/a	n/a	0.14	0.5%	29.6	0.5%
H22	Footpath	n/a	n/a	n/a	n/a	0.57	1.9%	29.6	1.9%
H23	Footpath	n/a	n/a	n/a	n/a	0.31	1.0%	29.6	1.1%
H24	Footpath	n/a	n/a	n/a	n/a	0.12	0.4%	29.7	0.4%
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	0.79	2.6%	29.6	2.7%
Notes: Shaded entries denote locations of non-relevant exposure									

Table 67 Long-term and short-term results H₂S

ID	Receptors	Comparison with annual mean AQAL: 140µg/m ³				Comparison with maximum hourly AQS: 150µg/m ³			
		PC (µg/m ³)	PC/AQAL (%)	PEC (µg/m ³)	PEC/AQAL (%)	PC (µg/m ³)	PC/AQAL (%)	Headroom (µg/m ³)	PC/Headroom (%)
H1	Cotswold Community Residences	0.0007	0.0005%	0.0007	0.0005%	0.0007	0.0005%	150	0.0005%
H2	<10 Residential properties	0.0009	0.0006%	0.0009	0.0006%	0.0009	0.0006%	150	0.0006%
H3	South Cerney (Town)	0.0009	0.0007%	0.0009	0.0007%	0.0009	0.0006%	150	0.0006%
H4	Residential property	0.0003	0.0002%	0.0003	0.0002%	0.0003	0.0002%	150	0.0002%
H5	Cross Roads Farm	0.0003	0.0002%	0.0003	0.0002%	0.0003	0.0002%	150	0.0002%
H6	<10 residential properties (along B4696)	0.0002	0.0002%	0.0002	0.0002%	0.0002	0.0001%	150	0.0001%
H7	Primary School playing fields	n/a	n/a	n/a	n/a	0.0008	0.0005%	150	0.0005%
H8	Whitefriars Sailing Club	n/a	n/a	n/a	n/a	0.0006	0.0004%	150	0.0004%
H9	Lake 62 LPS Events (Watersports)	n/a	n/a	n/a	n/a	0.0004	0.0003%	150	0.0003%
H10	Bike track	n/a	n/a	n/a	n/a	0.0005	0.0003%	150	0.0003%
H11	Bird hide	n/a	n/a	n/a	n/a	0.0003	0.0002%	150	0.0002%
H12	Hoburne Cotswold Holiday Park	0.0003	0.0002%	0.0003	0.0002%	0.0003	0.0002%	150	0.0002%
H13	Recreation/ playground	n/a	n/a	n/a	n/a	0.0002	0.0002%	150	0.0002%
H14	South Cerney Angling Club	n/a	n/a	n/a	n/a	0.0003	0.0002%	150	0.0002%
H15	Aggregate Industries	n/a	n/a	n/a	n/a	0.0008	0.0005%	150	0.0005%
H16	Sand and Gravel works	n/a	n/a	n/a	n/a	0.0004	0.0003%	150	0.0003%
H17	Cirencester WwTW	n/a	n/a	n/a	n/a	0.0003	0.0002%	150	0.0002%
H18	Industrial / Trading Estate	n/a	n/a	n/a	n/a	0.0008	0.0005%	150	0.0005%
H19	3No. commercial units	n/a	n/a	n/a	n/a	0.0007	0.0005%	150	0.0005%
H20	Storage yard	n/a	n/a	n/a	n/a	0.0005	0.0003%	150	0.0003%
H21	Allotments gardens	n/a	n/a	n/a	n/a	0.0008	0.0005%	150	0.0005%
H22	Footpath	n/a	n/a	n/a	n/a	0.0008	0.0005%	150	0.0005%
H23	Footpath	n/a	n/a	n/a	n/a	0.0027	0.0018%	150	0.0018%
H24	Footpath	n/a	n/a	n/a	n/a	0.0007	0.0005%	150	0.0005%
H25	Telephone Exchange Building	n/a	n/a	n/a	n/a	0.0010	0.0007%	150	0.0007%
Notes: Shaded entries denote locations of non-relevant exposure									

Appendix G Ecological receptor results

Table 68 Results: Ecological receptors, long-term AQAL for NH₃

ID	Receptors	AQAL (µg/m³)	BG (µg/m³)	Comparison with annual mean AQAL			
				PC (µg/m³)	PC/AQAL (%)	PEC (µg/m³)	PEC/AQAL (%)
E1	Cotswold Water Park (SSSI) 1	n/a	n/a	n/a	n/a	n/a	n/a
E2	Cotswold Water Park (SSSI) 2	n/a	n/a	n/a	n/a	n/a	n/a
E3	Cotswold Water Park (SSSI) 3	n/a	n/a	n/a	n/a	n/a	n/a
E4	Cotswold Water Park (SSSI) 4	n/a	n/a	n/a	n/a	n/a	n/a
E5	Cotswold Water Park (SSSI) 5	n/a	n/a	n/a	n/a	n/a	n/a
E6	Wildmoorway Meadows SSSI	3	2.3	0.007	0.23%	2.31	77%
E7	Upper Waterhay Meadow SSSI	3	2.4	0.003	0.09%	2.40	80%
E8	Acres Farm Meadow SSSI	3	2.4	0.002	0.07%	2.40	80%
E9	Elmlea Meadows SSSI	3	2.4	0.003	0.09%	2.40	80%
E10	Kemble Railway Cuttings SSSI	n/a	n/a	n/a	n/a	n/a	n/a
E11	Stoke Common Meadows SSSI	3	2.5	0.001	0.05%	2.50	83%
E12	Distillery Farm Meadows SSSI	3	2.5	0.001	0.03%	2.50	83%
E13	Emmett Hill Meadows SSSI	1	2.6	0.001	0.09%	2.60	260%
E14	Cloatley Farm SSSI	3	2.6	0.001	0.03%	2.60	87%
E15	Cloatley Manor Farm Meadows SSSI	3	2.5	0.001	0.03%	2.50	83%
E16	Ravensroost Wood SSSI	1	2.6	0.001	0.07%	2.60	260%
E17	Barnsley Warren SSSI	1	2.2	0.001	0.05%	2.20	220%
E18	Restrop Farm & Brockhurst Wood SSSI	1	2.6	0.001	0.07%	2.60	260%
E19	Pike Corner SSSI LWS	1	2.4	0.004	0.38%	2.40	240%
E20 (SAC)	North Meadow and Clattinger Farm SAC	3	2.4	0.002	0.07%	2.40	80%
E20 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	3	2.4	0.002	0.07%	2.40	80%
E21 (SAC)	North Meadow & Clattinger Farm SAC	3	2.4	0.003	0.11%	2.40	80%
E21 (SSSI)	Clattinger Farm SSSI	3	2.4	0.003	0.11%	2.40	80%
E22 (SAC)	North Meadow & Clattinger Farm SAC	3	2.4	0.002	0.08%	2.40	80%

E22 (SSSI)	Clattinger Farm SSSI	3	2.4	0.002	0.08%	2.40	80%
E23 (SAC)	North Meadow and Clattinger Farm SAC	3	2.4	0.002	0.05%	2.40	80%
E23 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	3	2.4	0.002	0.05%	2.40	80%
E24	Cokes Pit LNR Lake 34 LWS (1)	1	2.3	0.011	1.08%	2.31	231%
E25	Cokes Pit LNR Lake 34 LWS (2)	1	2.3	0.011	1.12%	2.31	231%
E26	LWS (CWP lake Pit 26), Priority Habitat	1	2.3	0.148	14.8%	2.45	245%
E27	LWS (CWP lake Pit 26), Priority Habitat	1	2.3	0.111	11.1%	2.41	241%
E28	LWS (CWP lake Pits 28, 28a, 29, 30, 35, 38)	1	2.5	0.010	0.96%	2.46	246%
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS	1	2.3	0.024	2.39%	2.32	232%
E30	River Churn LWS	n/a	n/a	n/a	n/a	n/a	n/a
E31	South Cerney Railway Cutting	n/a	n/a	n/a	n/a	n/a	n/a
E32	Shorncote Quarry RIGS	n/a	n/a	n/a	n/a	n/a	n/a
E33	Siddington Copse	1	2.3	0.003	0.26%	2.30	230%
Notes: n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified							

Table 69 Results: Ecological receptors, long-term AQAL for NOx

ID	Receptors	AQS ($\mu\text{g}/\text{m}^3$)	BG ($\mu\text{g}/\text{m}^3$)	Comparison with annual mean AQS: $30\mu\text{g}/\text{m}^3$			
				PC ($\mu\text{g}/\text{m}^3$)	PC/AQS (%)	PC ($\mu\text{g}/\text{m}^3$)	PC/AQS (%)
E1	Cotswold Water Park (SSSI) 1	n/a	n/a	n/a	n/a	n/a	n/a
E2	Cotswold Water Park (SSSI) 2	n/a	n/a	n/a	n/a	n/a	n/a
E3	Cotswold Water Park (SSSI) 3	n/a	n/a	n/a	n/a	n/a	n/a
E4	Cotswold Water Park (SSSI) 4	n/a	n/a	n/a	n/a	n/a	n/a
E5	Cotswold Water Park (SSSI) 5	n/a	n/a	n/a	n/a	n/a	n/a
E6	Wildmoorway Meadows SSSI	30	9.0	0.17	0.6%	9.17	31%
E7	Upper Waterhay Meadow SSSI	30	8.5	0.06	0.2%	8.56	29%
E8	Acres Farm Meadow SSSI	30	7.8	0.04	0.1%	7.84	26%
E9	Elmlea Meadows SSSI	30	8.6	0.06	0.2%	8.66	29%
E10	Kemble Railway Cuttings SSSI	n/a	n/a	n/a	n/a	n/a	n/a
E11	Stoke Common Meadows SSSI	30	8.7	0.03	0.1%	8.73	29%
E12	Distillery Farm Meadows SSSI	30	8.2	0.02	0.1%	8.22	27%
E13	Emmett Hill Meadows SSSI	30	7.7	0.02	0.1%	7.72	26%
E14	Cloatley Farm SSSI	30	7.5	0.02	0.1%	7.52	25%
E15	Cloatley Manor Farm Meadows SSSI	30	7.3	0.02	0.1%	7.32	24%
E16	Ravensroost Wood SSSI	30	8.2	0.02	0.1%	8.22	27%
E17	Barnsley Warren SSSI	30	7.3	0.02	0.1%	7.32	24%
E18	Restrop Farm & Brockhurst Wood SSSI	30	9.9	0.02	0.1%	9.92	33%
E19	Pike Corner SSSI LWS	30	7.9	0.06	0.2%	7.96	27%
E20 (SAC)	North Meadow and Clattinger Farm SAC	30	9.1	0.05	0.2%	9.15	30%
E20 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	30	9.1	0.05	0.2%	9.15	30%
E21 (SAC)	North Meadow & Clattinger Farm SAC	30	7.7	0.06	0.2%	7.76	26%
E21 (SSSI)	Clattinger Farm SSSI	30	7.7	0.06	0.2%	7.76	26%
E22 (SAC)	North Meadow & Clattinger Farm SAC	30	7.7	0.05	0.2%	7.75	26%
E22 (SSSI)	Clattinger Farm SSSI	30	7.7	0.05	0.2%	7.75	26%
E23 (SAC)	North Meadow and Clattinger Farm SAC	30	10.8	0.04	0.1%	10.8	36%
E23 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	30	10.8	0.04	0.1%	10.8	36%
E24	Cokes Pit LNR Lake 34 LWS (1)	30	7.9	0.15	0.5%	8.04	27%
E25	Cokes Pit LNR Lake 34 LWS (2)	30	7.9	0.17	0.6%	8.06	27%
E26	LWS (CWP lake Pit 26), Priority Habitat,	30	9.6	2.46	8.2%	12.1	40%

E27	LWS (CWP lake Pit 26), Priority Habitat,	30	9.9	2.87	9.6%	12.8	43%
E28	LWS (CWP lake Pits 28, 28a, 29, 30, 35, 38)	30	7.9	0.14	0.5%	8.00	27%
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS	30	8.0	0.32	1.1%	8.29	28%
E30	River Churn LWS	n/a	n/a	n/a	n/a	n/a	n/a
E31	South Cerney Railway Cutting	n/a	n/a	n/a	n/a	n/a	n/a
E32	Shorncote Quarry RIGS	n/a	n/a	n/a	n/a	n/a	n/a
E33	Siddington Copse	30	8.7	0.06	0.2%	8.73	29%
Notes: n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified							

Table 70 Results: Ecological receptors, short-term AQAL for NO_x

ID	Receptors	Comparison with maximum daily AQS: 75µg/m ³				Comparison with 24 hour mean AQS: 200 µg/m ³			
		PC (µg/m ³)	PC/AQS (%)	Headroom (µg/m ³)	PC/Headroom (%)	PC (µg/m ³)	PC/AQS (%)	Headroom (µg/m ³)	PC/Headroom (%)
E1	Cotswold Water Park (SSSI) 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E2	Cotswold Water Park (SSSI) 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E3	Cotswold Water Park (SSSI) 3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E4	Cotswold Water Park (SSSI) 4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E5	Cotswold Water Park (SSSI) 5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E6	Wildmoorway Meadows SSSI	2.34	3.1%	57.0	4.1%	0.17	0.08%	182	0.09%
E7	Upper Waterhay Meadow SSSI	1.66	2.2%	58.0	2.9%	0.06	0.03%	183	0.03%
E8	Acres Farm Meadow SSSI	1.14	1.5%	59.4	1.9%	0.04	0.02%	184	0.02%
E9	Elmlea Meadows SSSI	1.88	2.5%	57.8	3.3%	0.06	0.03%	183	0.03%
E10	Kemble Railway Cuttings SSSI	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E11	Stoke Common Meadows SSSI	0.70	0.9%	57.6	1.2%	0.03	0.01%	183	0.01%
E12	Distillery Farm Meadows SSSI	0.95	1.3%	58.6	1.6%	0.02	0.01%	184	0.01%
E13	Emmett Hill Meadows SSSI	0.64	0.8%	59.6	1.1%	0.02	0.01%	185	0.01%
E14	Cloatley Farm SSSI	0.43	0.6%	60.0	0.7%	0.02	0.01%	185	0.01%
E15	Cloatley Manor Farm Meadows SSSI	0.72	1.0%	60.4	1.2%	0.02	0.01%	185	0.01%
E16	Ravensroost Wood SSSI	0.71	1.0%	58.6	1.2%	0.02	0.01%	184	0.01%
E17	Barnsley Warren SSSI	0.47	0.6%	60.4	0.8%	0.02	0.01%	185	0.01%
E18	Restrop Farm & Brockhurst Wood SSSI	0.50	0.7%	55.2	0.9%	0.02	0.01%	180	0.01%
E19	Pike Corner SSSI LWS	2.53	3.4%	59.2	4.3%	0.06	0.03%	184	0.04%
E20 (SAC)	North Meadow and Clattinger Farm SAC	1.50	2.0%	56.8	2.6%	0.05	0.02%	182	0.03%
E20 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	1.50	2.0%	56.8	2.6%	0.05	0.02%	182	0.03%
E21 (SAC)	North Meadow & Clattinger Farm SAC	1.24	1.7%	59.6	2.1%	0.05	0.02%	185	0.02%
E21 (SSSI)	Clattinger Farm SSSI	1.24	1.7%	59.6	2.1%	0.05	0.02%	185	0.02%
E22 (SAC)	North Meadow & Clattinger Farm SAC	0.98	1.3%	59.6	1.6%	0.15	0.08%	185	0.08%
E22 (SSSI)	Clattinger Farm SSSI	0.98	1.3%	59.6	1.6%	0.15	0.08%	185	0.08%
E23 (SAC)	North Meadow and Clattinger Farm SAC	1.25	1.7%	53.4	2.3%	2.46	1.23%	178	1.38%
E23 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	1.25	1.7%	53.4	2.3%	2.46	1.23%	178	1.38%
E24	Cokes Pit LNR Lake 34 LWS (1)	4.76	6.4%	59.2	8.0%	0.15	0.08%	184	0.08%
E25	Cokes Pit LNR Lake 34 LWS (2)	2.92	3.9%	59.2	4.9%	0.17	0.08%	184	0.09%

E26	LWS (CWP lake Pit 26), Priority Habitat	25.8	34%	55.7	46%	2.46	1.23%	181	1.36%
E27	LWS (CWP lake Pit 26), Priority Habitat	31.4	42%	55.2	57%	2.87	1.44%	180	1.59%
E28	LWS (CWP lake Pits 28, 28a, 29, 30, 35, 38)	4.62	6.2%	59.3	7.8%	0.14	0.07%	184	0.08%
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS	5.47	7.3%	59.1	9.3%	0.32	0.16%	184	0.17%
E30	River Churn LWS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E31	South Cerney Railway Cutting RIGS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E32	Shorncote Quarry RIGS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E33	Siddington Copse	1.66	2.2%	57.7	2.9%	0.06	0.03%	183	0.03%
Notes: n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified									

Table 71 Results: Ecological receptors, long-term AQAL for SO₂

ID	Receptors	BG (µg/m³)	Comparison with annual mean AQS: 20µg/m³				Comparison with annual mean AQS: 10µg/m³			
			PC (µg/m³)	PC/AQS (%)	PEC (µg/m³)	PEC/AQS (%)	PC (µg/m³)	PC/AQS (%)	PEC (µg/m³)	PEC/AQS (%)
E1	Cotswold Water Park (SSSI) 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E2	Cotswold Water Park (SSSI) 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E3	Cotswold Water Park (SSSI) 3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E4	Cotswold Water Park (SSSI) 4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E5	Cotswold Water Park (SSSI) 5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E6	Wildmoorway Meadows SSSI	0.9	0.026	0.1%	0.93	4.63%	0.026	0.3%	0.93	9.26%
E7	Upper Waterhay Meadow SSSI	0.9	0.009	0.0%	0.91	4.55%	0.009	0.1%	0.91	9.09%
E8	Acres Farm Meadow SSSI	0.7	0.007	0.0%	0.71	3.54%	0.007	0.1%	0.71	7.07%
E9	Elmlea Meadows SSSI	0.8	0.010	0.0%	0.81	4.05%	0.010	0.1%	0.81	8.10%
E10	Kemble Railway Cuttings SSSI	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E11	Stoke Common Meadows SSSI	0.8	0.005	0.0%	0.80	4.02%	0.005	0.0%	0.80	8.05%
E12	Distillery Farm Meadows SSSI	0.8	0.003	0.0%	0.80	4.02%	0.003	0.0%	0.80	8.03%
E13	Emmett Hill Meadows SSSI	0.7	0.004	0.0%	0.70	3.52%	0.004	0.0%	0.70	7.04%
E14	Cloatley Farm SSSI	0.6	0.004	0.0%	0.60	3.02%	0.004	0.0%	0.60	6.04%
E15	Cloatley Manor Farm Meadows SSSI	0.6	0.004	0.0%	0.60	3.02%	0.004	0.0%	0.60	6.04%
E16	Ravensroost Wood SSSI	0.7	0.003	0.0%	0.70	3.51%	0.003	0.0%	0.70	7.03%
E17	Barnsley Warren SSSI	0.7	0.003	0.0%	0.70	3.51%	0.003	0.0%	0.70	7.03%
E18	Restrop Farm & Brockhurst Wood SSSI	0.8	0.003	0.0%	0.80	4.01%	0.003	0.0%	0.80	8.03%
E19	Pike Corner SSSI LWS	0.8	0.011	0.1%	0.81	4.05%	0.011	0.1%	0.81	8.11%
E20 (SAC)	North Meadow and Clattinger Farm SAC	0.9	0.008	0.0%	0.91	4.54%	0.0075	0.1%	0.91	9.08%
E20 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	0.9	0.008	0.0%	0.91	4.54%	0.0075	0.1%	0.91	9.08%
E21 (SAC)	North Meadow & Clattinger Farm SAC	0.7	0.010	0.1%	0.71	3.55%	0.0105	0.1%	0.71	7.10%
E21 (SSSI)	Clattinger Farm SSSI	0.7	0.010	0.1%	0.71	3.55%	0.0105	0.1%	0.71	7.10%
E22 (SAC)	North Meadow & Clattinger Farm SAC	0.7	0.008	0.0%	0.71	3.54%	0.0083	0.1%	0.71	7.08%
E22 (SSSI)	Clattinger Farm SSSI	0.7	0.008	0.0%	0.71	3.54%	0.0083	0.1%	0.71	7.08%
E23 (SAC)	North Meadow and Clattinger Farm SAC	1.1	0.006	0.0%	1.11	5.53%	0.0061	0.1%	1.11	11.1%
E23 (SSSI)	North Meadow Cricklade SSSI, (& North Meadow Cricklade NNR)	1.1	0.006	0.0%	1.11	5.53%	0.0061	0.1%	1.11	11.1%

E24	Cokes Pit LNR Lake 34 LWS (1)	0.7	0.025	0.1%	0.72	3.58%	0.025	0.3%	0.72	7.15%
E25	Cokes Pit LNR Lake 34 LWS (2)	0.7	0.028	0.1%	0.72	3.59%	0.028	0.3%	0.72	7.18%
E26	LWS (CWP lake Pit 26), Priority Habitat	0.7	0.481	2.4%	1.17	5.86%	0.481	4.8%	1.17	11.7%
E27	LWS (CWP lake Pit 26), Priority Habitat	0.7	0.510	2.5%	1.20	6.00%	0.510	5.1%	1.20	12.0%
E28	LWS (CWP lake Pits 28, 28a, 29, 30, 35, 38)	0.7	0.024	0.1%	0.71	3.57%	0.024	0.2%	0.71	7.14%
E29	Cotswold Water Park LWS Lakes 84 and 85 Shorncote Reedbed LWS	0.7	0.053	0.3%	0.74	3.71%	0.053	0.5%	0.74	7.43%
E30	River Churn LWS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E31	South Cerney Railway Cutting RIGS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E32	Shorncote Quarry RIGS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E33	Siddington Copse	0.7	0.010	0.0%	0.70	3.50%	0.010	0.1%	0.70	7.00%
Notes: n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified										

Table 72 Results: Ecological receptors, nutrient nitrogen deposition, nationally designated sites

Receptors	Deposition velocity type	BG NDep	Comparison with nutrient nitrogen critical loads							
			PC (kgN/ha/yr)	CLmin (kgN/ha/yr)	CLmax (kgN/ha/yr)	PC/CLmin (%)	PC/CLmax (%)	PEDR (kgN/ha/yr)	PEDR/CLmin (%)	PEDR/CLmax (%)
E1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E6	Grass	19.2	0.0528	20	30	0.26%	0.18%	19.25	96%	64%
E7	Grass	19.7	0.0197	20	30	0.10%	0.07%	19.72	99%	66%
E8	Grass	20.1	0.0155	20	30	0.08%	0.05%	20.12	101%	67%
E9	Grass	19.5	0.0203	20	30	0.10%	0.07%	19.52	98%	65%
E10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E11	Grass	20.6	0.0100	20	30	0.05%	0.03%	20.61	103%	69%
E12	Grass	20.8	0.0069	20	30	0.03%	0.02%	20.81	104%	69%
E13	Grass	20.9	0.0066	10	15	0.07%	0.04%	20.91	209%	139%
E14	Grass	21.1	0.0073	10	15	0.07%	0.05%	21.11	211%	141%
E15	Grass	20.9	0.0072	20	30	0.04%	0.02%	20.91	105%	70%
E16	Forest	36.4	0.0085	15	20	0.06%	0.04%	36.41	243%	182%
E17	Grass	20.9	0.0045	15	25	0.03%	0.02%	20.90	139%	84%
E18	Forest	37.6	0.0086	15	20	0.06%	0.04%	37.61	251%	188%
E19	Grass	20.0	0.0262	15	25	0.17%	0.10%	20.03	134%	80%
E20 (SAC)	Grass	19.6	0.0148	20	30	0.07%	0.05%	19.61	98%	65%
E20 (SSSI)	Grass	19.6	0.0148	20	30	0.07%	0.05%	19.61	98%	65%
E21 (SAC)	Grass	20.1	0.0233	20	30	0.12%	0.08%	20.12	101%	67%
E21 (SSSI)	Grass	20.1	0.0233	20	30	0.12%	0.08%	20.12	101%	67%
E22 (SAC)	Grass	20.1	0.0171	20	30	0.09%	0.06%	20.12	101%	67%
E22 (SSSI)	Grass	20.1	0.0171	20	30	0.09%	0.06%	20.12	101%	67%
E23 (SAC)	Grass	19.7	0.0117	20	30	0.06%	0.04%	19.71	99%	66%
E23 (SSSI)	Grass	19.7	0.0117	20	30	0.06%	0.04%	19.71	99%	66%
E24	Grass	20.0	0.0713	5	10	1.43%	0.71%	20.09	402%	201%
E25	Grass	20.0	0.0751	5	10	1.50%	0.75%	20.10	402%	201%
E26	Forest	34.3	1.6467	10	20	16.47%	8.23%	35.95	359%	180%
E27	Forest	34.3	1.4457	10	20	14.46%	7.23%	35.75	357%	179%

E28	Forest	34.9	0.1035	10	20	1.04%	0.52%	34.96	350%	175%
E29	Grass	20.0	0.1565	10	20	1.57%	0.78%	20.18	202%	101%
E30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E31	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E32	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E33	Forest	34.3	0.0319	10	20	0.32%	0.16%	34.33	343%	172%
Notes: *No further analysis required if PC/AQAL < 100% n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified										

Table 73 Results: Ecological receptors, acid deposition, nationally designated sites

Receptors	PC (keqS/ha/yr)	PC (keqN/ha/yr)	Background (keqS/ha/yr)	Background (keqN/ha/yr)	Maximum critical loads		
					PC (%)	Background (%)	PEC (%)
E1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E4	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E5	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E6	0.0031	0.0038	0.15	1.37	0.16%	35.0%	35.2%
E7	0.0011	0.0014	0.13	1.41	n/a	n/a	n/a
E8	0.0008	0.0011	0.13	1.43	0.09%	75.8%	75.9%
E9	0.0012	0.0015	0.13	1.39	0.06%	33.3%	33.4%
E10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E11	0.0006	0.0007	0.13	1.47	0.06%	77.7%	77.8%
E12	0.0004	0.0005	0.13	1.49	0.04%	78.7%	78.8%
E13	0.0004	0.0005	0.13	1.52	0.04%	80.2%	80.2%
E14	0.0005	0.0005	0.12	1.51	0.05%	78.8%	78.9%
E15	0.0005	0.0005	0.12	1.52	0.02%	35.9%	35.9%
E16	0.0007	0.0006	0.16	2.60	0.04%	93.9%	93.9%
E17	0.0003	0.0003	0.15	1.49	0.01%	33.8%	33.8%
E18	0.0007	0.0006	0.17	2.68	0.01%	26.1%	26.1%
E19	0.0013	0.0019	0.14	1.43	0.07%	36.2%	36.2%
E20 (SAC)	0.0009	0.0011	0.13	1.40	0.04%	33.6%	33.6%
E20 (SSSI)	0.0009	0.0011	0.13	1.40	0.04%	33.6%	33.6%
E21 (SAC)	0.0012	0.0017	0.14	1.44	0.06%	34.7%	34.7%
E21 (SSSI)	0.0012	0.0017	0.14	1.44	0.06%	34.7%	34.7%
E22 (SAC)	0.0010	0.0012	0.14	1.44	0.05%	34.7%	34.7%
E22 (SSSI)	0.0010	0.0012	0.14	1.44	0.05%	34.7%	34.7%
E23 (SAC)	0.0007	0.0008	0.13	1.41	0.03%	33.8%	33.8%
E23 (SSSI)	0.0007	0.0008	0.13	1.41	0.03%	33.8%	33.8%
E24	0.0030	0.0051	0.20	1.43	0.19%	37.4%	37.6%

E25	0.0033	0.0054	0.20	1.43	0.20%	37.4%	37.6%
E26	0.1139	0.1176	0.24	2.45	2.11%	24.6%	26.7%
E27	0.1206	0.1033	0.24	2.45	2.04%	24.6%	26.6%
E28	0.0057	0.0074	0.16	2.49	0.12%	24.2%	24.3%
E29	0.0062	0.0112	0.20	1.43	0.36%	33.6%	33.9%
E30	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E31	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E32	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E33	0.0023	0.0023	0.24	2.45	0.04%	24.5%	24.5%
Notes: APIS Critical Load Screening Function prescribes the Clos relevant for Appropriate assessment (HRA) / significance test (planning / EIA) based on acid deposition as a proportion of the Maximum CL Function (keq/ha/yr) n/a = not applicable/ available Shaded entries denote locations for which no sensitive habitat is identified							