PROPOSED ANAEROBIC DIGESTION FACILITY AT THREE MAIDS HILL, WINCHESTER

Air Quality Assessment

Prepared for: Acorn Bioenergy Ltd

Client Ref: Three Maids

SLR Ref: 404.11923.00004 Phase 4
Version No: v1.6
August 2022

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EXECUTIVE SUMMARY

This Air Quality Assessment has assessed the potential impacts on air quality and local amenity associated with the Proposed Development of an Anaerobic Digestion (AD) facility on land located between the A34 dual carriageway and the A272, Three Maids Hill, Winchester.

The potential impact associated with odour, dust, road traffic, bioaerosols, ammonia and CHP combustion emissions on both human and ecological receptors has been assessed.

The AD facility would capture biogas from the digestion of the feedstock types received for off-site export. The Proposed Development would comprise storage facilities for the incoming feedstock types, five digestors, a digestate lagoon, a digestate separator and a power generation unit (comprising two Combined Heat and Power (CHP) engines).

The construction phase assessment has concluded that the construction of the Proposed Development would result in a 'not significant' risk of impacts.

The operational phase assessment has concluded that the Proposed Development would result in a 'not significant' effect with regard to odour, dust and traffic emissions and that bioaerosols emissions screen out of the need for further assessment according to EA guidelines.

Potential impacts relating to combustion emissions from the CHP plant and ammonia emissions from the digestate and feedstocks could not be screened out, therefore further detailed assessment (dispersion modelling) has been undertaken, the findings of which are presented within two further reports (Appendix 01A).

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1.0 INTRODUCTION

SLR Consulting Limited (SLR) has been instructed by Acorn Bioenergy Ltd ('the client') to undertake an Air Quality Assessment (AQA) in support of their planning application for an Anaerobic Digestion (AD) facility (the 'Proposed Development') on land located between the A34 dual carriageway and the A272 to the north of Winchester.

The assessment describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing in the area. It then presents the potential impacts of the Proposed Development and an evaluation of the significance of effects.

1.1 Proposed Development

The AD facility would capture biogas from the digestion of the feedstock types received, for off-site export. The Proposed Development comprises storage facilities for the incoming feedstock types, five digestors, a digestate lagoon, a digestate separator and a power generation unit (comprising two Combined Heat and Power (CHP) engines).

1.2 Scope and Objective

This report considers the potential for the Proposed Development to impact upon local air quality and amenity in the vicinity of the Site.

The scope of the assessment comprises the following components:

- review of relevant local and national policy;
- baseline assessment – existing air quality in the local area;
- construction phase assessment – potential effects arising from construction activities, primarily dust and traffic emissions;
- operational phase assessment – potential effects arising as a result of odour, dust, bioaerosols, ammonia, and combustions emissions (from power generation and traffic);
- recommendation of mitigation measures, as appropriate.

The Environmental Health department at Winchester City Council (WCC) was consulted on the methodology and scope of the assessments[1], however no response was received.

[1] Email from SLR consulting to David Ingram and Amy Dales (and subsequently Philip Tidridge) at Winchester City Council, dated 16th March 2022.

2.0 RELEVANT LEGISLATION, POLICY & GUIDANCE

2.1 Legislative Context

2.1.1 Air Quality Strategy

The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales, and Northern Ireland (AQS) most recently updated in July 2007. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK.

The AQS sets standards and objectives for ten priority pollutants. Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Objectives are policy targets often expressed as maximum concentrations not to be exceeded either without exception or with a limited number of exceedances within a specified timescale.

The strategy objectives for the pollutants considered in this report are shown in Table 2-1.

2.1.2 Air Quality Regulations

The Air Quality Standards (AQS) Regulations 2010 (the regulations) transpose the Ambient Air Quality Directive (2008/50/EC) and transpose the Fourth Daughter Directive (2004/107/EC) within UK legislation.

The Regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQAL) throughout this report). Those relevant to this Air Quality Assessment are presented within Table 2-1.

2.1.3 Local Air Quality Management (LAQM)

Section 82 of the Environment Act 1995 (Part IV) requires local authorities to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any AQALs prescribed in regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, Local Authorities (LAs), have formal powers to control air quality through a combination of LAQM and by use of their wider planning policies.

Defra has published technical guidance for use by local authorities in their LAQM work[2]. This guidance, referred to in this report as LAQM.TG(16), has been used where appropriate in the assessment presented here.

2.1.4 General Nuisance Legislation

Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10µm (i.e. greater than PM_{10}) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

[2] Department for Environment, Food and Rural Affairs (DEFRA): Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16), April 2021.

2.1.5 Protection of Ecological Receptors

Sites of nature conservation importance at a European, national and local level, are provided environmental protection from developments, including from atmospheric emissions via the following legislation:

- Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') as amended
- Wildlife & Countryside Act 1981.

2.1.6 Environmental Permitting Regulations

The AD Facility is a type of operation that would be regulated under the Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No.1154 as amended). The EP Regulations include requirements on operating conditions, monitoring and Emission Limit Values (ELVs) that would be incorporated into the sites Permit and would be enforceable by the Environment Agency (EA).

Various guidance documents are provided by the EA with respect the operation and assessment of impacts from facilities regulated under EP Regulation. Key to air quality assessments is the 'Air Emissions Risk Assessment for your Environmental Permit' (AERA) guidance. The AERA guidance provides Environmental Assessment Levels (EALs) for pollutants not covered under the AQS or AQSR, such as ammonia and guidance on assessing impacts on ecological. Other guidance documents address assessment of risks from bioaerosols.

2.2 Environmental Standards

2.2.1 Standards for the Protection of Human Health

The standards applied in this assessment are shown in Table 2-1.

Table 2-1
Applied Air Quality Assessment Levels

Pollutant	Standard ($\mu g/m^3$)	Measured As		Ref.
Nitrogen Dioxide (NO_2)	40	Annual Mean	-	AQS
	200	1-hour Mean	not to be exceeded more than 18 times per year	
Sulphur Dioxide (SO_2)	125	24-hour Mean	not to be exceeded more than 3 times a calendar year	
	350	1-hour Mean	not to be exceeded more than 24 times a calendar year	
Particles (PM_{10})	40	Annual Mean	-	
	50	24-hour mean	not to be exceeded more than 24 times a calendar year	
Particles ($PM_{2.5}$)	25	Annual Mean	-	
Ammonia (NH_3)	180	Annual Mean	-	AERA
	2,500	1-hour Mean	-	

In accordance with the Department for Environment, Food and Rural Affairs' (DEFRA) technical guidance on Local Air Quality Management (LAQM.TG(16)), the AQALs should be assessed at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging

period of the objective. A summary of relevant exposure for the objectives presented in Table 2-1 are shown below in Table 2-2.

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	Relevant Locations	AQALs should apply at	AQALs should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.2.2 Standards for the Protection of Ecosystems and Vegetation

Critical Levels (C_{Le})

C_{Le}'s are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The relevant C_{Le} for the protection of vegetation and ecosystems is specified within the UK air quality regulations and AERA guidance.

Table 2-3
Relevant C_{Le} for the Protection of Vegetation and Ecosystems

Pollutant	Concentration (µg/m^3)	Habitat and Averaging Period
Nitrogen oxides (NOx)	30	Annual mean (all ecosystems)
	75 (A)	Daily mean (all ecosystems)
Ammonia (NH_3)	3.0 (B)	Annual mean
Sulphur dioxide (SO_2)	10	Annual mean (where lichens or bryophytes are present)
	20	Annual mean (all ecosystems)

Table note:

(A) The 24-hour mean NOx critical level is generally considered to be 75 µg/m3, however a less stringent NOx critical level can be applied in areas where concentrations of SO_2 and ozone are not high.

(B) A more stringent level (1.0 µg/m^3) applies where lichens and bryophytes form a key part of the ecosystem integrity.

Critical Loads (C_{Lo})

C_{Lo}'s are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical loads are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions, critical loads for eutrophication and acidification are relevant. Eutrophication and acidification can occur via both wet and dry deposition; however, on a local scale only dry (direct deposition) is considered significant.

Empirical C_{Lo} for eutrophication (derived from a range of experimental studies) are assigned based on different habitats, including grassland ecosystems, mire, bog and fen habitats, freshwaters, heathland ecosystems, coastal and marine habitats, and forest habitats and can be obtained from the UK Air Pollution Information System (APIS) website (www.apis.ac.uk/).

C_{Lo} for acidification have been set in the UK using an empirical approach for non-woodland habitats on a 1km grid square based upon the mineralogy and chemistry of the dominant soil series present in the grid square, and the simple mass balance (SMB) equation for both managed and unmanaged woodland habitats.

The C_{Lo}'s for the ecological sites subject to assessment are presented in Section **Error! Reference source not found.**.

2.3 Planning Policy

2.3.1 National Policy

The 2021 update to the National Planning Policy Framework (NPPF) describes the policy context in relation to pollutants including air pollutants:

> "*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 […] air […] pollution […]. Development should, wherever possible, help to improve local environmental conditions such as air […] quality […]*"
>
> "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*"

Specifically, in terms of development with regards to air quality:

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

The NPPF is accompanied by supporting Planning Practice Guidance[3] (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. The November 2019 update to the PPG includes the following in regard to air quality:

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

The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that "*Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions) […] Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact*".

The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this assessment.

2.3.2 Local Policy

The Site lies within the administrative area of WCC. The Winchester District Local Plan (WDLP)[4] was adopted by WCC in March 2013. The WDLP presents the strategy for the development and use of land in the District, as well as containing the policies for delivering these objectives. The WDLP also references established policies from the 2006 Winchester District Local Plan Review[5].

The following policy was identified to be of direct relevance to this assessment:

> *"Policy DP.10: Development which may generate air, land, light, surface water or groundwater pollution, and which accords with other relevant policies of this Plan, will only be permitted where the Local Planning Authority is satisfied that it has been designed to reduce the impact to an acceptable level.*
>
> *Proposals should comply with statutory standards of environmental quality and environmental protection policies required by the pollution control authorities…"*

WCC have also produced the Air Quality Supplementary Planning Document[6] (AQSPD) to provide additional guidance on air quality assessment for proposed development within the administrative area.

The following passages were identified to be of direct relevance to this assessment:

> *"Air Quality Assessments (AQA) will be required for all major developments within the SPD area which could increase road traffic or include commercial combustion processes."*
>
> and
>
> *"When an AQA is required it should follow the guidance provided by the Institute of Air Quality Management in their document Land Use Planning and Development Control: Planning for Air Quality"*

Consideration has been given to the above policy and guidance within this assessment.

[3] Planning Practice Guidance Air Quality (2014) (June 2021 Update) Ministry of Housing, Communities and Local Government. https://www.gov.uk/government/collections/planning-practice-guidance
[4] Winchester District Local Plan 2013, Adopted March 2013.
[5] Winchester District Local Plan Review, adopted 2006.
[6] WCC Air Quality Supplementary Planning Document, September 2021.

2.4 Assessment Guidance

The air quality assessment has been carried out in accordance with the principles contained within the following guidance documents:

- The Department for Environment, Food and Rural Affairs (DEFRA): Local Air Quality Management Technical Guidance (LAQM.TG(16));
- DEFRA: COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021[7];
- IAQM: Use of 2020 and 2021 Monitoring Datasets[8];
- Environmental Protection UK (EPUK) and the Institute of Air Quality Management Guidance (IAQM): Land-Use Planning and Development Control: Planning for Air Quality[9];
- IAQM: Guidance on the Assessment of Dust from Demolition and Construction[10];
- IAQM: Guidance on the assessment of odour for planning[11];
- IAQM: Guidance on the Assessment of Mineral Dust Impacts for Planning[12];
- EA position statement 031: Composting and potential health effects from bioaerosols; and
- Environment Agency: Air emissions risk assessment for your environmental permit.

[7] DEFRA and the Greater London Authority, COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021. April 2021.
[8] Use of 2020 and 2021 monitoring datasets, August 2021, Version 1.0. Institute of Air Quality Management. Available at: https://iaqm.co.uk/wp-content/uploads/2013/02/IAQM_2020_and_2021_monitoring_datasets.pdf.
[9] EPUK and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, 2017.
[10] IAQM, Guidance on the Assessment of Dust from Demolition and Construction, v1.1, 2016.
[11] IAQM, Guidance on the assessment of odour for planning, Version 1.1, July 2018.
[12] IAQM, Guidance on the Assessment of Mineral Dust Impacts for Planning, v1.1, 2016.

3.0 ASSESSMENT METHODOLOGY

3.1 Assessment of Construction Dust

A construction dust assessment has been undertaken with reference to IAQM guidance. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- track-out.

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM10; and
- harm to ecological receptors.

The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of the site activities associated with the construction phase of the scheme. A detailed assessment is required where a:

- human receptor is located within 350m of the Site, and/or within 50m of routes used by construction vehicles, up to 200m from the site entrance(s); and/or
- ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 200m from the site entrance(s).

The dust emission class (or magnitude) for each activity is determined on the basis of the guidance, indicative thresholds and professional judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application, residual effects are considered to be 'not significant'.

3.2 Road Traffic Emissions

The assessment of air quality effects in relation to traffic generated during the construction and operational phase of the Proposed Development has been screened in accordance with EPUK-IAQM and DMRB guidance. This comprises a two-staged screening process to identify where further assessment is required. If the Proposed Development does not meet exceed the screening criteria, then effects are considered insignificant.

The applied screening procedure is as follows:

- Stage 1: Comparison of road traffic trips generated by the Proposed Development with reference to EPUK-IAQM thresholds to determine the extent of the affected road network:
    - within or adjacent to an AQMA:
        - a change of Light-Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT); and/or
        - a change of Heavy-Duty Vehicle (HDV) flows of more than 25 AADT.
    - outside of an AQMA:
        - a change of LDV flows of more than 500 AADT; and/or

  - a change of HDV flows of more than 100 AADT.

- Stage 2: Spatial review with use of satellite imagery to determine whether exposure exists within 200m of an affected road (as per the DMRB LA 105).

3.3 Assessment of Odour

The assessment of fugitive odour emissions from the operation of the Proposed Development has been undertaken on the basis of a conceptual model, as per the IAQM odour guidance, that takes into consideration the potential sources, surrounding receptors and the pathway between source and receptor in order to assess the magnitude of risk.

Specifically the following aspects are reviewed:

- the type of activities proposed on site including designed-in mitigation measures in order to determine:
  - the potential magnitude of releases in general terms; and
  - the nature of that release.
- the location of receptors in the surrounding area with specific consideration of the type of receptor and therefore their potential sensitivity according to guidance; and
- the pathway between source and receptors incorporating distance between receptors and any mitigating features as well as the frequency of wind conditions likely to result in the dispersion of emissions towards receptors.

The key steps and methodology are available on the IAQM website[13].

3.4 Assessment of Dust

The assessment of fugitive dust emissions from the Proposed Development has been undertaken on the basis of a conceptual model that takes into consideration the potential sources, surrounding receptors and the pathway between source and receptor in order to assess the magnitude of risk.

Specifically the following aspects are reviewed:

- the type of activities proposed on site including designed-in mitigation measures in order to determine:
  - the potential magnitude of releases in general terms; and
  - the nature of that release.
- the location of receptors in the surrounding area with specific consideration of the type of receptor and therefore their potential sensitivity to dust; and
- the pathway between source and receptors incorporating buffer distance between receptors and any mitigating features as well as the frequency of wind conditions likely to result in the dispersion of emissions towards receptors.

3.5 CHP Emissions Screening

The screening assessment of CHP emissions from the Proposed Development has been undertaken using the Simple Calculation of Atmospheric Impact Limits (SCAIL) for Combustion model[14] developed for the EA. The model requires inputs of location (for the selection of meteorological data), receptor locations and emission source inputs (location and emission rate).

[13] http://iaqm.co.uk/text/guidance/odour-guidance-2014.pdf
[14] Centre for Ecology and Hydrology, Simple Calculation of Atmospheric Impact Limits (SCAIL) – Combustion (last updated March 2020).

The results are then compared to environmental standards for human health and ecological protection (as outlined in Section 2.2) to determine if emissions can be considered insignificant or whether detailed modelling is required.

In accordance with AERA guidance, emissions to air can be considered to be insignificant and not require further assessment where:

- European Sites:
  - the long-term process contribution is <1% of the long-term environmental standard; and
  - the short-term process contribution is <10% of the short-term environmental standard.
- Local sites:
  - the long-term process contribution is <100% of the long-term environmental standard; and
  - the short-term process contribution is <100% of the short-term environmental standard.

For process contributions that cannot be considered insignificant, a second stage of risk assessment is undertaken and the need for detailed modelling is determined against the following threshold criteria:

- [Maximum Process Contribution (long term) + background concentration] > 70% of the environmental standard; or
- Maximum Process Contribution (short term) > 20% of the difference between the short-term environmental standard minus twice the long-term background concentration.

3.6 Assessment of Bioaerosols

In lieu of sector-specific or planning-specific guidance on the assessment of bioaerosols from Anaerobic Digestion, the regulatory position on the assessment of bioaerosols from composting has been adopted. The EA's current position is that the requirement for assessment of bioaerosols emissions can be screened out where potential source of bioaerosols are located at a distance of 250m or more from sensitive receptors (such as workplaces or dwellings).

Where potential sources of bioaerosols are located within 250m of sensitive receptors, a Source-Specific Bioaerosols Risk Assessment (SSBRA) should be undertaken.

Although it is noted that this guidance was produced in consideration of open-air composting operations, adoption of this approach represents a conservative assessment approach as the Proposed Development is anticipated to have a lesser potential for the release of bioaerosols in comparison to composting operations.

3.7 Assessment of Ammonia

The screening assessment of fugitive ammonia emissions from the Proposed Development has been undertaken using the Simple Calculation of Atmospheric Impact Limits (SCAIL) model[15] developed for the EA.

The model requires inputs of location (for the selection of meteorological data), receptor locations and ammonia source inputs (location and emission rate). Predicted impacts at ecological receptors have been assessed by comparison to the assessment levels as outlined in Section 2.2.

[15] Centre for Ecology and Hydrology, Simple Calculation of Atmospheric Impact Limits (SCAIL) – Agriculture (last updated 18th October 2021);

4.0 BASELINE ENVIRONMENT

4.1 Site Setting and Sensitive Receptors

The Proposed Development is located on land between the A34 dual carriageway and the A272 at approximate National Grid Reference (NGR): x446100 y133920. The Proposed Development is located within the administrative area of WCC and is not located within, or in proximity to, an AQMA.

The area surrounding the Proposed Development is primarily rural agricultural land, with isolated commercial and residential properties. Worthy Down, a more densely populated residential area, is located at a distance of 500m or more to the east of the Proposed Development. Planning permission has been has been granted for an inert waste recycling facility at the southern boundary of the Site[16], and as such this location of potential sensitivity has been considered within this assessment.

Primary vehicular access would be via the A272.

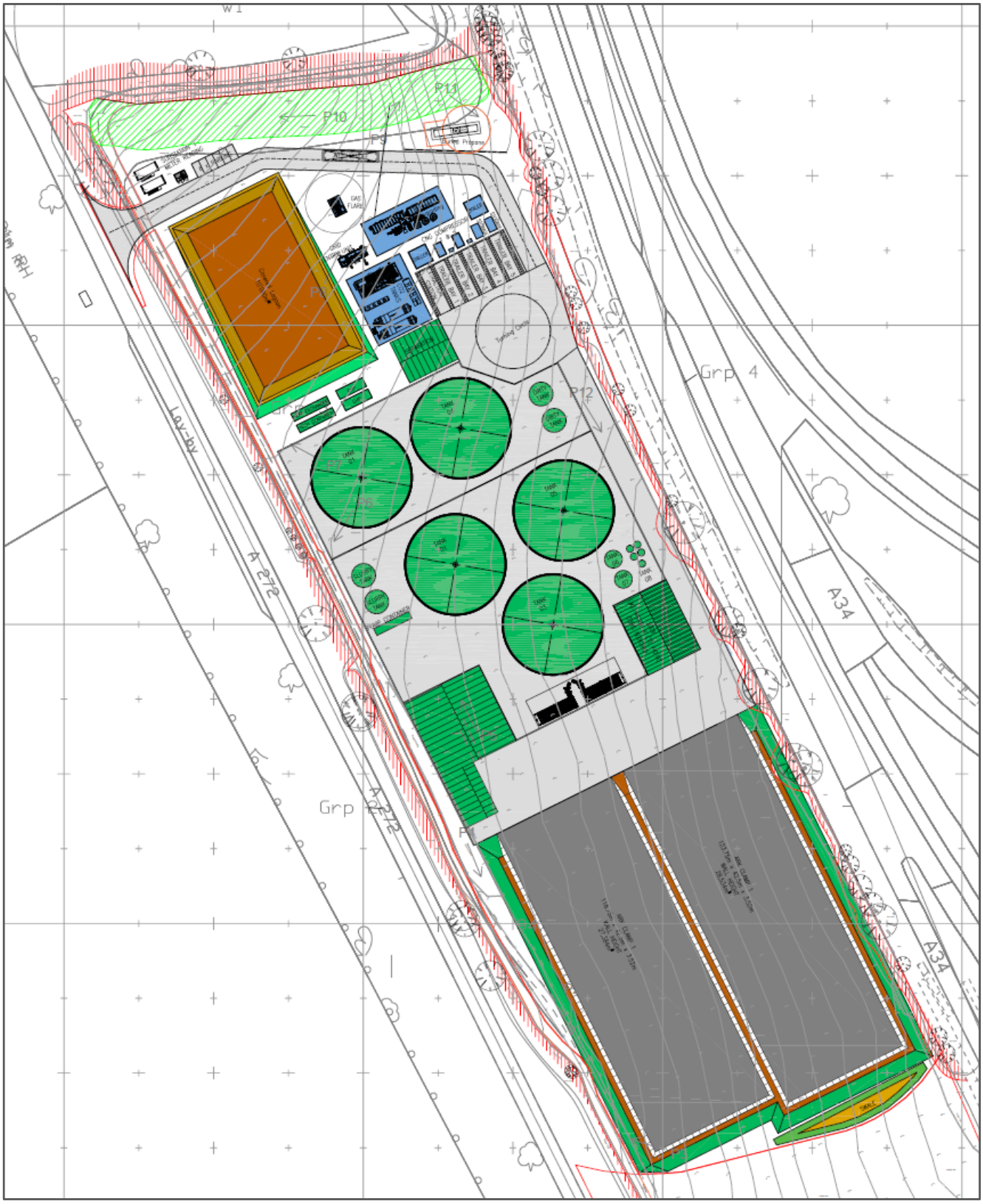
There are a number of ecological sites in proximity to the Proposed Development; the Worthy Grove and Long Wood Ancient Woodlands and the River Itchen SAC/SSSI. Worthy Grove comprises 3 sections of woodland located to the north and northwest at a distance of 260m or more. The River Itchen SAC/SSSI is located 3.7km to the southeast.

Figure 4-1 below presents the Proposed Development boundary (red outline), nearest sensitive human receptors (green triangles) and sensitive ecological receptors (light blue shaded areas).

[16] WCC planning reference: 20/01765/HCS.

Figure 4-1
Site Setting & Sensitive Receptors

The proposed Site layout is presented in Figure 4-2 below.



Credit: GGP Consult Site Layout Plan Ref.29348-101A

Figure 4-2
Proposed Site Layout

4.1.1 Human Receptors

The most sensitive human receptors would be residential properties and amenity areas, with commercial or industrial receptors typically having a lower sensitivity due to the reduced frequency of occupation and amenity expectations.

Receptors in proximity to the Proposed Development with a sensitivity to emissions have been identified and presented in Table 4-1 below. The selection of human receptors has considered the closest receptor locations in each direction to provide a precautionary assessment representative of the general scale of impacts. The sensitivity applied to each receptor (where applicable) has been determined based upon the relevant IAQM guidance.

Table 4-1
Human Receptor Locations

Receptor		Receptor Coordinates (x,y)		Receptor Type	Sensitivity to Odour	Sensitivity to Dust	Direction from Site	Distance from Site
DR1	Stud Lane	446066	133554	Residential	High	High	South	265m
DR2	Stud Lane	445560	133637	Residential	High	High	South-west	550m
DR3	PCE Motorpark /10TENMOTOX	446566	133909	Recreational /Commercial	Medium	Low	East	380m
DR4	Off Down Farm Lane	446961	133702	Residential	High	High	East	800m
DR5	Worthy Down	446064	134935	Residential	High	High	North	690m
DR6	Worthy Down	446385	134884	Residential	High	High	North	730m
DR7	Worthy Down	446628	134847	Residential	High	High	North-east	840m
DR8	Worthy Down	446898	134795	Residential	High	High	North-east	1020m
DR9	Worthy Down	446057	134998	Residential	High	High	North	750m
DR10	South Wonston	446041	135676	Residential	High	High	North	1440m
DR11	Larkwhistle Farm Oil Well	445141	135505	Industrial	Low	Low	North-west	1520m
DR12	Inert waste recycling facility	448460	134760	Industrial	Low	Low	South	0m

4.1.2 Ecological Receptors

The AERA Guidance requires that ecological habitats should be screened against relevant standards if they are located within the following set distances from the facility:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation; and
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNR), Local Nature Reserves (LNR), Local Wildlife Sites (LWS) and Ancient Woodland (AW) within 2km of the installation.

A review using the Magic web-based mapping service[17] was undertaken to identify any designated sites of ecological or nature conservation importance required for consideration within the assessment.

Ancient woodlands (Worthy Grove and Long Wood) are located within approximately 140m north-west of the Site. The River Itchen SAC/SSSI is located approximately 2.7km to the south-east.

4.2 Ambient Air Quality

4.2.1 Local Air Quality Management

A review of WCC's most recent Annual Status Report (ASR)[18] indicates that air quality, in regard to NO_2 concentrations, is generally good across rural areas, with some areas of elevated concentrations at the centre of Winchester.

WCC have declared a single AQMA for exceedances of the NO_2 objective: the Winchester Town Centre AQMA. The AQMA is located at a distance of more than 3km from the Proposed Development, therefore this AQMA has not been considered further within this study.

4.2.2 Passive Diffusion Tube Monitoring

Passive diffusion tube monitoring is currently undertaken by WCC at numerous locations throughout the Council's administrative area as part of their commitment to LAQM. The diffusion tubes are located in areas which are deemed to require further assessment of NO_2 concentrations. The majority of monitoring locations are located within the Winchester Town Centre AQMA and are therefore not representative of the site locale (which is rural and not within an AQMA).

A small number of monitoring locations are located in rural areas, but only one of these rural monitoring locations is in proximity to the Site. The monitored NO_2 concentrations at this monitoring location are presented in Table 4-2 below.

Table 4-2
NO_2 Diffusion Tube Monitoring Results

Monitoring Location	Site Classification	Approximate Distance / Direction from the Site	Annual Mean Concentration (µg/m³)		
			2018	2019	2020
'Site 3' (District Study)	Other (A)	3.6km, southeast	40.5	34.5	25.0

(A) The location is defined as 'other' within the ASR. Review of aerial imagery places the monitoring location at the roadside on the B3047, but the exact location is unconfirmed.

As presented in Table 4-2 above, recorded annual mean NO_2 concentration exceeded the annual mean NO_2 AQAL in 2018, but has steadily decreased in subsequent years. It should be noted that the monitoring location is located at a distance of just 0.5m from the kerb (of the B3047) and within 100m of the A33 (and 600m from the M3).

An IAQM position statement on the use of 2020 and 2021 monitoring datasets given the effect of the ongoing COVID-19 pandemic and implications on reductions to traffic flows recommends:

[17]Natural England, www.magic.gov.uk, accessed November 2021.
[18] 2021 Annual Status Report (ASR), Winchester City Council, June 2021.

"If you are carrying out an air quality study that includes validation against monitoring data, use 2019 monitoring data as the last typical year."

The latest publicly available ASR for WCC at the time of writing is the 2021 ASR and therefore the data presented for 2020 was potentially impacted by the COVID-19 pandemic. As such, the 2020 data has been discounted from further consideration.

4.2.3 Automatic Air Quality Monitoring

WCC have a number of automatic monitoring stations, however all of these are located within Winchester and therefore have not been considered further within this study.

The closest Automatic Urban and Rural Network (AURN) monitoring location is located in Chilbolton, approximately 8km northwest of the Site. The Chilbolton Observatory monitor is set within an 'Urban Background' monitoring location, with no major roads or industrial areas in close proximity.

The monitored NO_2, PM_{10} and $PM_{2.5}$ concentrations monitored at this location are presented in Table 4-3 below.

Table 4-3
Automatic Monitoring Results

Monitoring Location	Monitoring Period	Site Classification	Approximate Distance / Direction from the Site	Annual Mean Concentration (µg/m³)		
				NO_2	PM_{10}	$PM_{2.5}$
Chilbolton Observatory (UKA00614)	01/01/2020 to 31/12/2020	Rural Background	8km, northwest	6.3	12.3	7.6

The recorded annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant AQALs.

4.2.4 Defra Modelled Background Concentrations and Projections

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

Predictions of background pollutant concentrations on a 1km-by-1km grid basis have been produced by DEFRA for the entirety of the UK to assist LAs in their Review and Assessment of air quality[19]. Mapped background concentrations of NO_2, PM_{10} and $PM_{2.5}$ based upon the 2018 base year Defra update and projected to 2022, were downloaded for the grid squares containing the Site and relevant receptors, as presented within Table 4-4.

Table 4-4
Background Concentrations for Study Area

Pollutant	2022 Mapped Background Concentration (µg/m³)	
	Min	Max
NO_2	8.1	10.9

[19] Background mapping data for local authorities – http://uk-air.defra.gov.uk/data/laqm-background-home, accessed April 2022.

Pollutant	2022 Mapped Background Concentration (µg/m^3)	
	Min	Max
PM_{10}	12.2	14.5
$PM_{2.5}$	8.2	9.1

The Defra background predictions indicate annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant AQALs across the study area.

4.2.5 Monitoring of Other Pollutants

Ammonia, sulphur dioxide and ozone are not monitored as part of the LAQM regime, therefore they do not form part of the monitoring undertaken by WCC.

Ammonia, sulphur dioxide and ozone are monitored nationally through the '*National Ammonia Monitoring Network*', the 'Acid Gas and Aerosol Network' and the 'AURN'. These networks are used to quantify temporal and spatial changes in concentrations of these compounds on a long-term basis. The monitoring results from the closest monitoring site (Chilbolton Observatory) are presented in Table 4-5.

Table 4-5
Estimated Annual Mean Background Concentrations

Site Name	Site Type	X (NGR)	Y (NGR)	2021 Annual Average NH_3 (µg/m^3)	2021 Annual Maximum SO_2 (µg/m^3)	2021 AOT40 ozone (µg/m^3)	2021 AOT40 5-year ozone (µg/m^3)
Chilbolton Observatory (UKA00614)	Rural Background	439390	139078	3.7	6.1	5,799	11,875

4.3 Baseline Conditions at Ecological Receptors

The APIS website[20], a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology has been used to provide information on background pollutant concentrations, current deposition rates and C_{Lo}'s for nutrient nitrogen (Table 4-6) and C_{Lo} functions for acidity (Table 4-7).

[20] http://www.apis.ac.uk/, accessed December 2020.

Table 4-6
Nitrogen Critical Loads and Current Loads

Site	APIS Critical Load Class (most sensitive)	NO_x Annual Mean (µg/m³)	NH_3 Annual Mean (µg/m³)	SO_2 Annual Mean (µg/m³)	Critical Load Range (kg N/ha/yr)	Critical Load Applied in Assessment (kg N/ha/yr)	Current Load (kg N/ha/yr)
Worthy Grove (AW)	Broadleaved, Mixed and Yew Woodland	14.64	2.06	0.79	10-20	10	34.16
River Itchen (SAC/SSSI)	Broadleaved, Mixed and Yew Woodland	14.64	2.06	0.79	10-20	10	34.16

Table 4-7
Acid Critical Load Functions and Current Loads

Site	APIS Critical Load Class (most sensitive)	Critical Load Function (k_{eq}/ha/yr)			Current Load (k_{eq}/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
Worthy Grove AW	Broadleaved, Mixed and Yew Woodland	11.027	0.142	11.169	2.44	0.19
River Itchen (SAC/SSSI)	Broadleaved, Mixed and Yew Woodland	0.32	0.14	0.60	2.44	0.19

In reference to the results presented in Section 4.2.5, the recorded maximum sulphur dioxide concentration and AOT40 ozone concentration (for 2021 and as a 5-year average) are below the relevant limits and are therefore not considered 'high' in this area. This therefore indicates that application of the 200 µg/m³ 24-hour critical level is appropriate for sensitive ecological receptors in this area.

4.4 Meteorological Conditions

The most important climatic parameters governing the release and dispersal of fugitive emissions from the Site are:

- wind direction which determines the broad direction of dispersal; and
- wind speed will affect ground level emissions by increasing the initial dilution of pollutants in the emission.

The nearest meteorological recording station to the Site is the Middle Wallop meteorological recording station, approximately 16km west of the Proposed Development at a similar elevation (90m). A windrose from Middle Wallop meteorological recording station, showing the frequency of wind speed and direction, used in the assessment is provided in Figure 4-3 below. The windrose shows winds from the south-west and west are most prevalent.

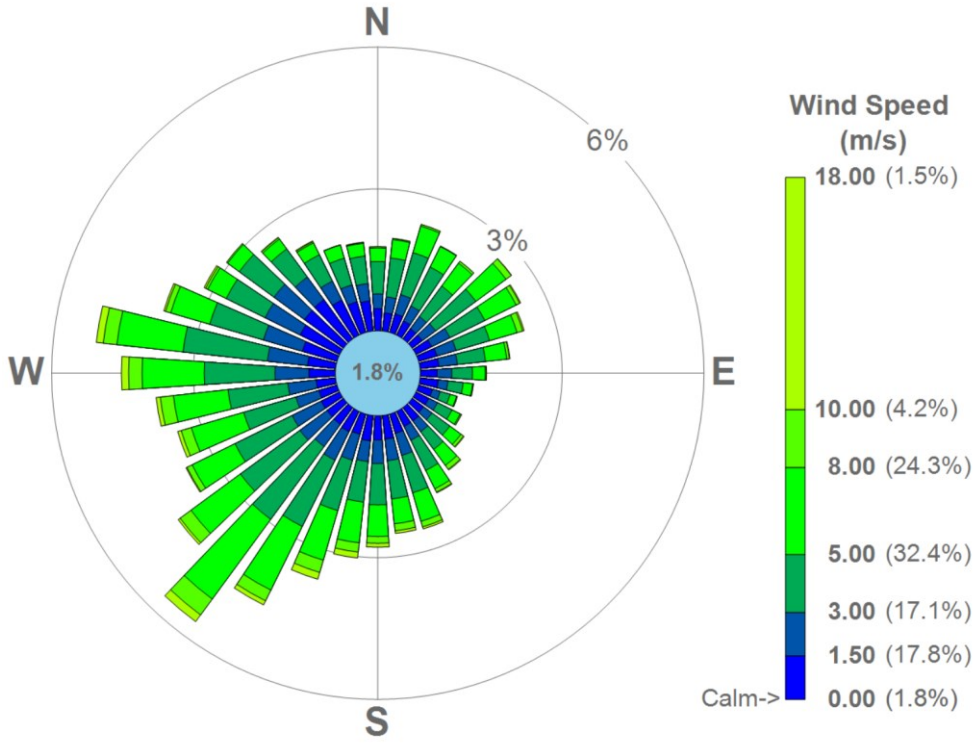


Figure 4-3
Middle Wallop Recording Station Windrose (2015 - 2019 average)

One of the most important meteorological factors to consider when undertaking an assessment of odour, bioaerosols or dust is low wind speeds (winds below 5m/s). During periods of low wind speeds, the dispersion of airborne particles/odours is much less effective. Low wind speeds (below 5m/s) are relatively frequent at approximately 65% of hours in an 'average' year, predominantly from the west and southwest. Moderate to high winds (above 5m/s) occur for the remaining hours (approximately 35%) in an 'average' year, again predominantly form the west and southwest.

Rainfall is also an important climatological parameter in the generation of dust. Sufficient amounts of rainfall can suppress dust at the source and eliminate the pathway to the receptor. Rainfall greater than 0.2mm per day is considered sufficient to suppress dust emissions.

Relevant rainfall data applicable to the Site has been obtained from the Meteorological Office website[21]. Utilising the map of climate averages from the met office, the number of days with rainfall greater than 0.2mm is between 170 and 180 days per year (~48%).

4.5 Existing Emissions Sources

4.5.1 Existing Sources of Odour, Dust, Ammonia

A review of baseline conditions with respect to odours in the surrounding area has been undertaken by reviewing aerial imagery. Through review of aerial imagery the only significant source of odours, dust and ammonia identified is the existing agricultural activities in the area (i.e. working of agricultural land). However in

[21] Meteorological Office, UK Climate Averages https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcjs3tzpf. Accessed April 2022.

consideration of the likely infrequent nature of these activities, this potential source has not been considered further within this assessment.

Planning permission has been approved for an inert waste recycling facility on land bordering the Proposed Development to the south (see Figure 4-1). As outlined within the planning application[22], the proposed activities at the facility include the receipt, storage, processing (screening and/or crushing) and export of topsoil and aggregates. The proposed facility is not considered to represent a significant potential source of odour or ammonia emissions as a result of these operations.

The appeal decision issued by the Planning Inspectorate[23] outlines that the facility is a potential source of dust emissions. However, as outlined within the appeal decision document, potential dust emissions from the facility would be controlled through the Environmental Permit (EP) issued, and in adherence to the Dust Management Plan (DMP) produced. The appeal decision also notes that: *"In addition to these measures, there is already woodland around the site and planted bunds of 3 metres in height would be provided. These measures would provide containment and screening in the event of any dust generation from unforeseen circumstances such as weather events. For these reasons it is unlikely that any dust pollution would arise."*

As such, in consideration of the above, the inert waste recycling facility is not considered a significant source of dust emissions and therefore has not been considered further within this assessment.

4.5.2 Bioaerosols

Offsite activities and the local environments can affect localised concentrations of bioaerosols in ambient air. An investigation of ambient bioaerosols at an AD site reported background ambient fungi concentrations offsite in wet woodland comparable to those on-site. Additionally, it was reported that mowing of a nearby meadow also significantly elevated viable fungi and bacteria concentrations.

Therefore, it should be considered that the nearby agricultural and wooded areas can represent a significant potential source of bioaerosols.

The consented inert waste recycling facility on land bordering the Proposed Development to the south is not considered to represent a significant potential source of bioaerosol emissions as a result of the proposed operations.

[22] WCC planning application reference: 20/01765/HCS.
[23] Appeal Ref: APP/Q1770/W/21/3279319, dated 20th June 2022.

5.0 CONSTRUCTION PHASE ASSESSMENT

5.1 Construction Dust Assessment

Where figures relating to area of the Site, volume of the Site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

As presented in Figure 5-1 below, there are human receptors within 350m of Site and one sensitive ecological site within 50m of the boundary, or within 50m of the route used by construction vehicles on the public highway, up to 200 m from the site entrance(s). As such, an assessment considering both human and ecological receptors is required.

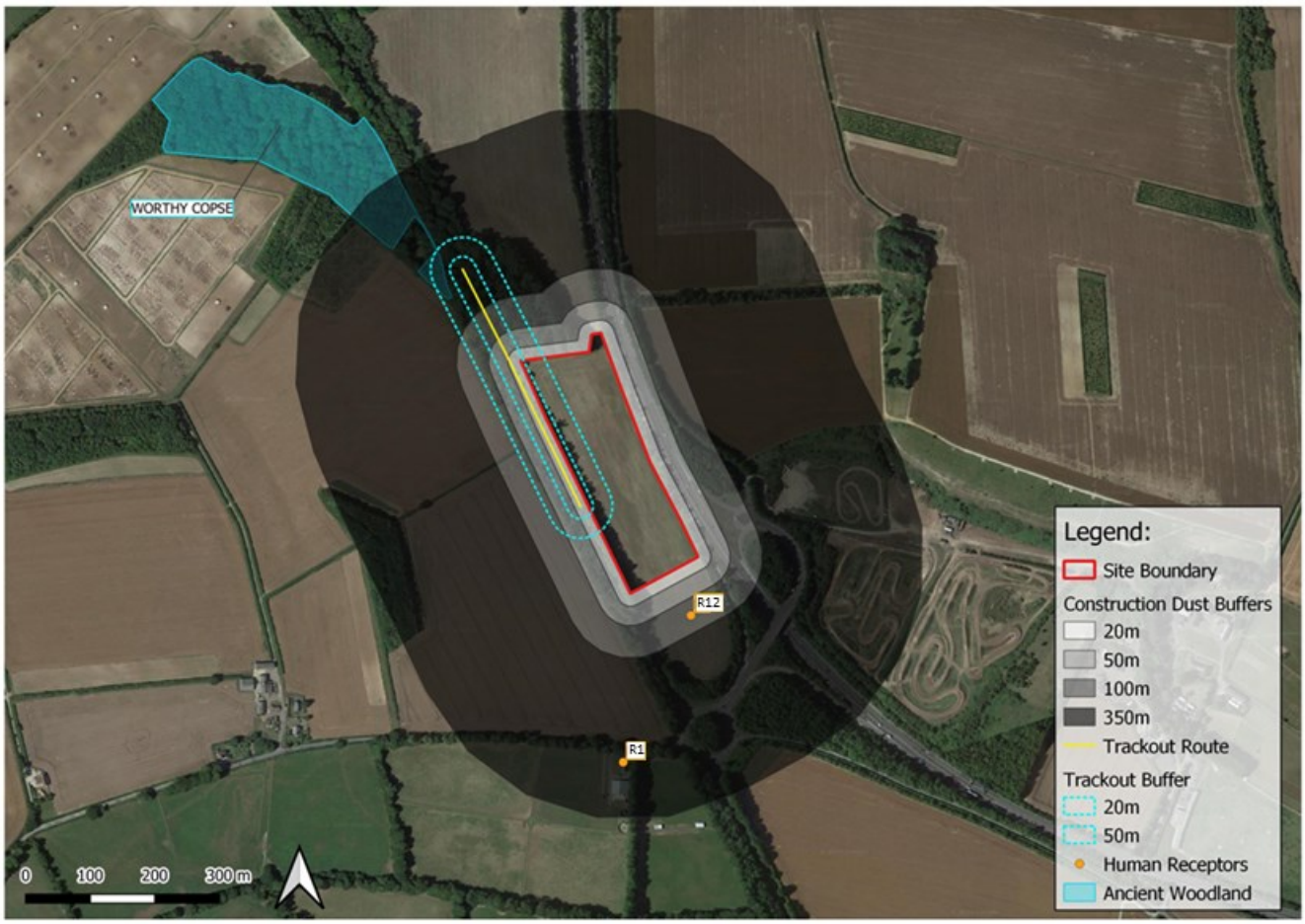


Figure 5-1
Construction Dust Screening Distances

5.1.1 Potential Dust Emissions Magnitude

The potential dust emission magnitude for each activity has been assessed and assigned on the basis of the criteria presented in the IAQM guidance and is presented in Table 5-1.

Table 5-1
Potential Dust Emission Magnitude

Activity	Considerations	Dust Emission Magnitude
Demolition	The Site is undeveloped agricultural land. As such, no demolition activities are proposed in the construction of the Proposed Development.	n/a
Earthworks	Site earthworks are required over an area of approximately 5 hectares (50,000m^2). This constitutes a 'large' dust emission magnitude in accordance with IAQM criterion (area greater than 10,000m^2). Due to the scale of the proposed plans and the size of the Site, it has been assumed that 10 or more heavy earth moving vehicles may be active at any one time.	Large
Construction	The total building volume is predicted to be less than 25,000m^3. This constitutes a 'small' dust emission magnitude in accordance with the IAQM criterion. Construction materials are likely to comprise concrete bases with structure of steel framework and cladding. There is the potential for concrete batching to be undertaken over the construction period, therefore the overall dust emissions magnitude is considered 'medium'.	Medium
Trackout	Given the scale and nature of works required, there are anticipated to be between 10 and 50 Heavy Duty Vehicle (HDV) outward movements in any worst-case day. Given the size of the Site, the worst-case unpaved road length is anticipated be between 50 and 100m at any given time.	Medium

5.1.2 Sensitivity of the Area

Dust Soiling Impacts

The Site surroundings comprise agricultural/cultivated land and woodland, with isolated dwellings further afield. There are no high sensitivity receptors located within 50m of the Site or within 50m of the access routes 50m from the Site entrance. The nearest high sensitivity receptor is an isolated dwelling located at a distance of 265m south. An inert waste recycling facility is proposed at the southern boundary of the site; however such operations are of a low sensitivity to dust.

The sensitivity of the area with respect to dust soiling effects on people and property in relation to earthworks, construction and trackout is therefore considered to be 'low'.

Human Health Impacts

The maximum background PM_{10} concentration in the site locale is predicted to be 14.5µg/m^3, based upon 2022 mapped background estimates (i.e. falls into the <24µg/m^3 class).

Given the above information regarding the number of residential receptors in proximity of the Proposed Development, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore considered to be 'low'.

Ecological Sites

There is ancient woodland located within 20m of the trackout area, but at a distance of more than 50m from the site boundary. As such the sensitivity of the area with respect to ecological impacts in relation to trackout is considered to be 'low', and ecological impacts in relation to earthworks and construction is considered negligible.

Summary

A summary of the sensitivity of the area for each potential impact and activity is presented in Table 5-2.

Table 5-2
Sensitivity of the Area

Potential Impact	Sensitivity of Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low
Human Health	Low	Low	Low
Ecological	n/a	n/a	Low

5.1.3 Risk of Impacts

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table 5-3 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Table 5-3
Risk of Dust Impacts (without mitigation)

Potential Impact	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	Low Risk
Human Health	Low Risk	Low Risk	Low Risk
Ecological	n/a	n/a	Low Risk

Following the construction dust assessment, the Proposed Development is predicted to have a 'low' risk in relation to dust soiling, human health and ecological impacts at nearby sensitive receptors. Furthermore, any potential dust effects during the construction phase would be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

5.1.4 Mitigation Measures

The specific mitigation measures proposed are presented in Section 7.1.1.

5.1.5 Mitigation Measures

The specific mitigation measures proposed are presented in Section 7.1.1.

5.2 Construction Traffic Screening

5.2.1 Trip Generation

The construction phase of the Proposed Development would result in a temporary increase in road traffic arriving at and leaving the Site, and as such a screening assessment of the associated trip generation is required.

Construction of the Proposed Development would result in the temporary employment of contractors at the Site. The associated increase in LDVs (from contractors commuting to work) has been considered through adoption of a suitably conservative assessment approach; assuming that all contractors travel to the Site via car (without carpooling) every day.

In consideration of the size and nature of the construction operations, the anticipated number of LDVs arriving at and leaving the Site each day is anticipated to be fewer than 250.

The construction of the Proposed Development would result in import and exports of goods and materials to/from the Site via road. In consideration of the size and nature of the construction operations, the anticipated number of HDVs arriving at and leaving the Site each day is anticipated to be fewer than 50.

As such, it is anticipated that the import and export operations and commuting of contractors to the Site would result in less than 100 HDV and 500 LDV movements, as AADT.

5.2.2 Screening Assessment – Consideration of Potential Impacts

The Proposed Development is not located within or in proximity to any AQMAs, therefore the appropriate screening criteria have been applied.

Based upon the anticipated trip generation details outlined above, the predicted number of additional journeys (less than 100 HDVs and 500 LDVs as AADT) are below the relevant criteria for a site situated outside an AQMA.

Therefore, in accordance with the EPUK & IAQM Guidance, the *'impacts* [on air quality from construction phase trips] *can be considered as having an insignificant effect*'.

6.0 OPERATIONAL PHASE ASSESSMENT

6.1 Process Description

The feedstock types received at the Site would be mostly straw and silage (wheat, rye, maize and grass), comprising approximately 75% of the total, with the remainder comprising farmyard manure and poultry litter (remaining 25%). There is also the potential for utilisation of other feedstocks such as fruit and vegetable packing and processing materials, brewers' grain and pot ale (sourced from breweries). However, utilisation of these other feedstock options would likely be variable in nature and would comprise only a small fraction of the total feedstock utilised over the year.

Silage, straw and farmyard manure feedstocks would be received by road via tractors or lorries with open trailers. Poultry litter would be received within enclosed trailers.

Silage feedstocks would be stored within the designated outdoor area (Clamps 1 and 2), a concrete hardstanding area with retaining walls, and covered by weighed-down sheeting (comprising an oxygen barrier and bird netting). Straw would be stored within the Straw Bunker, a partially enclosed barn on hard-standing surface, providing protection from the weather.

Farmyard manure and poultry litter would be stored within the Manure Shed, which would be enclosed with passive ventilation.

Feedstock handling operations would comprise the movement of silage from the clamps, straw from the Straw Bunker and farmyard manure and poultry litter from the Manure Shed. The handling operations would be undertaken by a front-end loader (or similar such vehicle). Feedstock would be deposited within the hoppers periodically to load the digesters with new feedstock as required.

Leachate from Clamps 1 and 2 would be pumped to the leachate/digestate storage tank. The tank would be enclosed and fitted with passive ventilation (grating/louvre). The leachate would be diluted with rainwater runoff from the hardstanding clamp areas. A much smaller comparative volume of digestate liquors from the separation process (as detailed further below) would be collected in the same tank.

Following anaerobic digestion, digestate would be stored within an enclosed lagoon.

Road tankers will remove liquid digestate from the Site through use of a vacuum pumping system.

A portion of the liquid digestate produced would be processed into a solid form by the Separator. The Separator would remove most of the liquid from the digestate, with the liquid fraction (liquor) pumped to the leachate/digestate storage tank, and the solid fraction stored pending export. The Separator would be located within an enclosed building with passive ventilation (the Separator Building).

The solid digestate (fertiliser) produced by the Separator would be stored within a dedicated bay within the Separator building prior to export offsite. It is anticipated that solid digestate would only be stored at the Site for short periods, pending regular collections for off-site export.

Generation of heat and power for the proposed operations would be provided by two CHP engines.

6.2 Odour Assessment

6.2.1 Source Odour Potential

Potential Sources of Odours

The potential odour sources are described in Table 6-1.

Table 6-1
Potential Sources of Odours

Source	Considerations	Potential
Feedstock import	Import operations (road trucks/tractors with trailers) would be transient in nature. Feedstock types with a higher odour potential (poultry litter and farmyard manure) would be offloaded within the enclosed (passive ventilation) Manure Shed.	Small
Feedstock storage	Silage feedstocks are stored within Clamp 1 and 2, covered by weighed-down sheeting (comprising an oxygen barrier). Straw is stored within the Straw Bunker, a partially enclosed barn on hard-standing surface, providing protection from the weather. Poultry litter and farmyard manure would be stored within the Manure Shed, which would be enclosed and passively ventilated.	Small
Feedstock handling	The majority of the feedstock types handled, such as silage and straw, have a low odour potential. Whilst it is noted that poultry litter and farmyard manure have a higher associated odour potential, these feedstock types comprise a lesser fraction (25%). Handling events would be transient in nature.	Small
Leachate / liquor storage	Leachate from the silage clamps (diluted with rainwater runoff from the hardstanding clamp areas) would be stored within a dedicated tank. Digestate liquors from Separator would also be stored within the tank, but in comparatively low volumes compared to the runoff. The tank would be enclosed and fitted with passive ventilation (grating/louvre).	Small
Anaerobic digestion	The gas capture system would effectively contain potential odours from the anaerobic digestion process, for subsequent processing into biogas.	Negligible
Digestate	The digestate would be stored within an enclosed lagoon. Having been through the anaerobic digestion process, the material would have low microbial activity and therefore a low associated odour potential. However, the large surface area of the enclosed lagoon has also been considered.	Medium
Liquid digestate export	Road tankers would remove liquid digestate from the Site through use of a vacuum pumping system. Air displaced from within the tanker would be released to atmosphere, resulting in a limited volume of potentially odorous air being released from these transient activities.	Small
Production of solid digestate	From observations at other existing sites applying this process[24], the odour emissions from the separation process are anticipated to be low. The Separator would be located within an enclosed building with passive ventilation (the Separator Building).	Small
Solid digestate storage and export	Solid digestate (fertiliser) produced by the Separator would be stored within a dedicated bay within the Separator building. Solid digestate is anticipated to have a low odour potential, given the low microbial activity of the product (post anaerobic digestion) and the low water content (following processing by the Separator).	Small

[24] At other anaerobic digestion sites and at sewage treatment works, where the same technology is applied to produce a solid product.

Source	Considerations	Potential
	Export operations would comprise loading of trailers (within the Separator building), providing a level of containment to emissions resulting from agitation.	

Existing Sources of Odours

As outlined in Section 4.5.1, there are no significant existing sources of odour in the site locale.

Overall Source Odour Potential

In review of the above, adopting a suitably cautious approach, the combined source odour potential of the Proposed Development is considered to be 'medium'.

6.2.2 Pathway Effectiveness

The pathway effectiveness to the sensitive receptors was determined through a combination of the distance to the emission source, the frequency of winds with the potential to disperse odour towards that receptor and the effectiveness of dispersion/dilution of odours from the sources identified at the Site. The determination of pathway effectiveness is presented in Table 6-2. The effectiveness of dispersion/dilution of odours from the sources identified at the Site is considered to be low, reflecting open processes with low-level releases.

Table 6-2
Determination of Pathway Effectiveness

Receptor		Direction from Proposed Development Boundary	Distance from Proposed Development Boundary	Pathway Effectiveness
DR1	Residential	South	265m	Ineffective
DR2	Residential	South-west	550m	Ineffective
DR3	Commercial / recreational	East	380m	Moderately Effective
DR4	Residential	East	800m	Ineffective
DR5	Recreational	North	690m	Ineffective
DR6	Residential	North	730m	Ineffective
DR7	Residential	North-east	840m	Ineffective
DR8	Residential	North-east	1020m	Ineffective
DR9	Worthy Down	North	750m	Ineffective
DR10	South Wonston	North	1440m	Ineffective
DR11	Larkwhistle Farm Oil Well	North-west	1520m	Ineffective
DR12	Inert waste recycling facility	South	0m	Moderately Effective

6.2.3 Likely Magnitude of Odour Effect

The likely magnitude of odour effect has been determined by consideration of the source odour potential and the pathway effectiveness. The results are summarised in Table 6-3.

Table 6-3
Determination of Likely Odour Effect

Receptor		Source Odour Potential	Pathway Effectiveness	Odour Exposure Risk	Receptor Sensitivity	Likely Odour Effect
DR1	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR2	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR3	Commercial /recreational	Medium	Moderately Effective	Low	Medium	Negligible effect
DR4	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR5	Recreational	Medium	Ineffective	Negligible	High	Negligible effect
DR6	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR7	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR8	Residential	Medium	Ineffective	Negligible	High	Negligible effect
DR9	Worthy Down	Medium	Ineffective	Negligible	High	Negligible effect
DR10	South Wonston	Medium	Ineffective	Negligible	High	Negligible effect
DR11	Larkwhistle Farm Oil Well	Medium	Ineffective	Negligible	Low	Negligible effect
DR12	Inert waste recycling facility	Medium	Moderately Effective	Low	Low	Negligible effect

The likely odour effect is predicted to be 'negligible' at all of the considered receptors.

The likely significance of effects as a result of odours is therefore considered to be 'not significant' at all identified receptor locations in accordance with the IAQM guidance.

6.3 Dust Impact Assessment

6.3.1 Assessment of Impacts – Screening Criteria

There is a human receptor and an ecological receptor with a sensitivity to dust soiling within 250m of the Site boundary (see Section 4.1). Therefore, further assessment for the potential impact of deposited dust and PM_{10} on human and ecological receptors is required.

6.3.2 Dust Soiling Potential

The potential dust sources are described in Table 6-4.

Table 6-4
Potential Sources of Dust

Source	Considerations	Potential
Feedstock import	Silage offloaded within the clamps. Straw offloaded within partially enclosed structure (Straw Bunker). Poultry Litter offloaded within an enclosed structure (Manure Shed). Import operations would be transient in nature.	Small
Feedstock storage	Silage feedstocks are stored within Clamps 1 and 2, covered by weighed-down sheeting (comprising an oxygen barrier). Clamps 1, 2 and 3 have a hard-standing surface and retaining walls. Straw is stored within the Straw Bunker, a partially enclosed barn on hard-standing surface, providing protection from the weather. Poultry litter and farmyard manure would be stored within the Manure Shed, which would be enclosed and passively ventilated.	Small
Feedstock handling	Operations would comprise the movement of silage from the clamps, straw from the straw barn and poultry litter and farmyard manure from the Manure Shed to the hopper. The handling operations would be undertaken by heavy plant, anticipated to be a front-end loader. Handling operations would be transient in nature.	Small
Vehicle Movements	Movement of vehicles across the hardstanding traffic routes at the Site, associated with import/export operations (lorries or tractors with trailers) and handling operations (front-end loader). Vehicle movements would be transient in nature.	Small
Solid digestate storage and export	Solid digestate (fertiliser) produced by the Separator would be stored within a dedicated bay within the Separator building. Solid digestate is anticipated to have a low odour potential, given the low microbial activity of the product (post anaerobic digestion) and the low water content (following processing by the Separator). Export operations would comprise loading of trailers (within the Separator building), providing a level of containment to emissions resulting from agitation.	Small

Existing Sources of Dust

As outlined in Section 4.5.1, there are no significant existing sources of dust in the site locale.

Overall Residual Source Emission

In consideration of the above, the overall residual source emission is considered 'small'.

6.3.3 Likely Magnitude of Dust Risk

In reference to the methodology outlined in the IAQM mineral dust guidance, the likely magnitude of dust effects has been determined by consideration of the residual source emission and the pathway effectiveness. The results are summarised in Table 6-5 below.

Table 6-5
Determination of Likely Dust Effects

Receptor		Residual Source Emissions	Pathway Effectiveness	Dust Impact Risk	Receptor Sensitivity	Magnitude of Dust effects
R12	Inert waste recycling facility	Small	Moderately effective	Negligible Risk	Low	Negligible Effect
Eco	Ancient Woodland (Worthy Grove)	Small	Ineffective	Negligible Risk	Low	Negligible Effect
Table note: Sensitive receptors at a distance of more than 250m have not been considered.						

The likely dust effect is predicted to be 'negligible' at all sensitive receptors identified.

The likely significance of effects as a result of dust generation from the proposed operations at the Proposed Development is therefore considered to be 'not significant' at all identified receptor locations in accordance with the IAQM guidance.

6.3.4 PM_{10} Generation Potential

The assessment of PM_{10} follows the key elements as recommended within the IAQM Minerals guidance, whilst incorporating the AQAL for England. The likelihood of exceedance of the PM_{10} AQAL as a result of the Proposed Development has been assessed.

The existing air quality, in terms of annual PM_{10}, has been taken from the Defra background maps to represent a conservative approach (nearby Chilbolton monitoring station recorded a lower PM_{10} concentration in 2020 than predicted by the background maps). The maximum background PM_{10} concentrations for the grid square of the Site and surrounding receptors is 14.5 µg/m³, representing approximately 40% of the corresponding AQAL for PM_{10}. Moreover, concentrations are predicted to decrease year on year. On this basis, an increase in PM concentrations in the local area as a result of the operations at the Proposed Development is not anticipated.

It is therefore considered that in the absence of designed-in or additional mitigation, the impact and effect of the proposed operations on human health from emissions of PM_{10} (and $PM_{2.5}$) would be negligible.

6.4 Traffic Screening Assessment

6.4.1 Trip Generation

It is anticipated that the Proposed Development would result in the following approximate daily trip generation (as AADT):

- 10 LDV trips – due to the employment of 5 staff at the Site; and
- 76 HDV trips - daily average calculated from the total anticipated number of HDVs arriving/departing based on annual tonnages processed – daily trips would fluctuate on a seasonal basis (i.e. during the harvest season when silage is brought in from the fields).

6.4.2 Screening Assessment – Consideration of Potential Impacts

The Proposed Development is not located within or in proximity to any AQMAs, therefore the less stringent screening criteria have been applied.

Based upon the trip generation details outlined above, the predicted number of additional development trips are below the relevant criteria for a site situated outside an AQMA (as outlined in Section 3.2) for both LDVs and HDVs (500 LDVs and 100 HDVs AADT). Therefore, in accordance with the EPUK & IAQM Guidance, the *'impacts* [on air quality from operational phase trips] *can be considered as having an insignificant effect*'.

6.5 CHP Emissions Screening

Generation of heat and power for the proposed operations would be facilitated by two CHP engines:

- CHP 1: fuelled on biogas, producing 0.9 MW_e; and
- CHP 2: fuelled on natural gas, producing 2.0 MW_e.

The screening input parameters are detailed in Table 6-6 below.

Table 6-6
Combustion Screening Parameters

Parameter	CHP1	CHP2
Electrical output	0.9 MW_e	2.0 MW_e
Stack height	7m	7m
Effective release height (A)	0m	0m
Fuel type	Biogas	Natural gas
Emission concentration (NO_2)	190 mg/Nm^3	95 mg/Nm^3
Emission concentration (SO_2)	40 mg/Nm^3	- (B)
Volume Flow (Nm^3/s)	1.4	2.8
Emission rate (NO_2)	0.27 g/s	0.27 g/s
Emission rate (SO_2)	0.056 g/s	- (B)
Background NO_2 concentration	10.9 µg/m^3	
Background SO_2 concentration	0.8 µg/m^3	

Table notes:
(A) Effective release height takes into account the downwash and turbulence caused by surrounding structures.
(B) Assessment of SO_2 emissions from natural gas-fired combustion plant is not required.

The PCs calculated from the dispersion factors (corresponding to an effective release height of 0m) indicate that further detailed assessment is required to investigate potential impacts upon human and ecological receptors as a result of NO_2 and SO_2 emissions from the CHP plant.

Potential impacts relating to combustion emissions from the CHP plant cannot not be screened out, therefore further detailed assessment (through dispersion modelling) is required, the findings of which are presented within a further report (Appendix 01A).

6.6 Bioaerosols Screening

The EA's current position is that the requirement for assessment of bioaerosols emissions can be screened out where potential sources of bioaerosols are located at a distance of 250m or more from sensitive receptors (such as workplaces or dwellings).

In reference to Section 4.1.1 there is one potentially sensitive human receptor within 250m of the Proposed Development; the Inert waste recycling facility to the south. However, when considering the distance between this receptor and the nearest potentially significant source of bioaerosols (the digestate lagoon) is greater than 250m (approximately 300m), therefore further consideration of bioaerosols emissions is not required.

6.7 Ammonia Screening

The potential sources of ammonia emissions from the proposed operations comprise the following:

- straw and silage feedstocks;
- poultry litter and farmyard manure feedstock; and
- digestate lagoon.

6.7.1 Emissions

Ammonia emissions from the feedstock types stored were defined in reference to the method outlined by Natural Resources Wales. The emissions parameters are defined in Table 6-7 below.

Table 6-7
Ammonia Emissions Parameters

Source Location (A)	Emission Source	Annual Throughput (tonnes)	Volume Stored (tonnes)	Storage Area (m^2)	Calculated Total NH_3 Emissions (kg/year)
x446060, y133980	Rye Silage	22,000	844 (A)	3,241	105.8
	Maize Silage	20,000	767 (A)		
	Grass Silage	5,000	192 (A)		
	Wheat Straw	17,500	671 (A)		
	Farmyard manure	5,000	192 (A)		
	Poultry litter	15,000	575 (A)		
	Digestate (liquid)	n/a	10,000 (B)	2,600	1001.2
	Digestate (solid)	n/a	1,200 (C)	270	283.5

Table note:
(A) Defined from the approximate annual throughput, averaged over a 14-day period to represent 2 weeks' storage of material at any one time.
(B) Defined assuming that the digestate lagoon would be full of (liquid) digestate at all times.
(C) Defined assuming that all the solid digestate storage bay within the Separator building is full at all times.

6.7.2 Screening Results

The results from the SCAIL screening model indicate that further detailed assessment is required to investigate potential impacts upon ecological receptors as a result of NH_3 emissions from the Proposed Development.

Potential impacts relating to ammonia emissions from the digestate and feedstocks cannot be screened out, therefore further detailed assessment (through dispersion modelling) is required, the findings of which are presented within a further report (Appendix 01A).

7.0 MITIGATION MEASURES

The screening assessment presented within Section 5.0 and Section 6.0 has determined that the Proposed Development will result in an 'insignificant' effect on air quality, with the exception of combustion and ammonia emissions, for which detailed assessment is required.

The proposed mitigation measures (for the construction and operational phase of the development) considered within this assessment are summarised below.

7.1 Construction Phase

7.1.1 Construction Dust Mitigation Measures

IAQM guidance outlines a number of site-specific mitigation measures based on the assessed site risk, as displayed in Table 7-1. The measures are grouped into those which are highly recommended and those which are desirable.

Table 7-1
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
Monitoring	Carry out regular site inspections to monitor compliance with the Dust Management Plan (DMP), record inspection results, and make an inspection log available to the local authority when asked.
	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.
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.
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
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.
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 offsite, and the action taken to resolve the situation in the logbook.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Communications	Develop and implement a DMP, which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM_{10} continuous monitoring and/or visual inspections.
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	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.
Monitoring	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 within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations	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	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 as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.

Site Application	Mitigation Measures
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 (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

7.1.2 Construction Traffic Mitigation Measures

No specific mitigation measures are required.

7.2 Operational Phase

7.2.1 Emissions Mitigation Measures

No specific mitigation measures are required further to those outlined under the proposed Site operations (see Section 6.1).

For ease, the embedded mitigation measures proposed, which have been considered within this assessment, are outlined below:

- Covering (sheeting) of silage within the clamps;
- poultry litter and farmyard manure to be enclosed within the Manure Shed (passively ventilated);
- the digestate lagoon to be enclosed (passively ventilated); and
- a site management system to ensure routine site cleaning measures are undertaken (i.e. spillages cleared and not left in situ).

8.0 CONCLUSIONS

This Air Quality Assessment has assessed the potential impacts on air quality and local amenity associated with the Proposed Development of an AD facility on land located between the A34 dual carriageway and the A272, Three Maids Hill, Winchester. The potential impact associated with odour, dust, road traffic, bioaerosols, ammonia and CHP combustion emissions on both human and ecological receptors has been assessed.

The construction phase assessment has concluded that the construction of the Proposed Development would result in a 'not significant' risk of impacts.

The operational phase assessment has concluded that the Proposed Development would result in a 'not significant' effect with regard to odour, dust and traffic emissions and that bioaerosols emissions screen out of the need for further assessment according to EA guidelines.

Potential impacts relating to combustion emissions from the CHP plant and ammonia emissions from the digestate and feedstocks could not be screened out, therefore further detailed assessment (dispersion modelling) has been undertaken, the findings of which are presented within two further reports (Appendix 01A).

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