

Air Quality Technical Note to Acorn Bioenergy Ltd

Impacts of the Proposed Anaerobic Digestion (AD) Plant at Land West of Ashton Road, Ashton Keynes, Wiltshire, SN6 6QT on Nearby Airfields

1. Introduction

- 1.1.1 Acorn Bioenergy Limited (ABL) submitted a planning application to Wiltshire County Council (WCC) for construction and operation of an Anaerobic Digestion (AD) Plant at land off Ashton Road, southeast of South Cerney, Ashton Keynes, Wiltshire, GL7 6DD, hereafter referred to as 'the Site'. The WCC planning reference number is PL/2023/03359 and it was validated on 09 May 2023. The proposal is hereafter referred to as the 'Proposed Development.'
- 1.1.2 The application was determined by the WCC Strategic Planning Committee on 21 April 2026. The committee resolved:
- 1.1.3 "To DEFER the application so that consultation with Gloucester Council Highways and Thames Water could take place."
- 1.1.4 Since the committee meeting, ABL submitted a Technical Note prepared by York Aviation, a specialist air transport consultancy who regularly advise on aviation safeguarding and operational safety matters, including to the Department of Transport and airport operators, addressing the matter of potential impacts of the Proposed Development to aviation safety. Extracts from the York Aviation Technical Note are shown in Table 1. Figure 1 shows the location of the Site and the four airports/aerodromes. The technical note concludes that the proposal does not pose an aerodrome safeguarding or wider aviation safety risk. (Table 1, paragraph 19).
- 1.1.5 The situation that had the potential for the greatest impact on aviation would be during a missed approach procedure for Cotswold Airport/Kemble, in the Runway 08 direction¹. During this procedure there is the potential for aircraft to pass approximately 310 m east of the Site at an altitude high above the level of the site, most likely between 425m and 510 m above ground level.

Table 1 Extracts from York Aviation Technical Note

- 3. This note considers whether the proposed anaerobic digestion facility (the "Proposed Development") at Land West of Ashton Road, Ashton Keynes (the "Site"), gives rise to any material aviation safeguarding risk in the context of Cotswold Airport/Kemble and RAF Fairford as well as grass strip aerodromes at Oaksey Park and South Cerney/RAF South **Cerney**. Typically, new development effects of interest to aerodromes are conventional aerodrome safeguarding matters: physical obstruction, interaction with approach or missed-approach procedures, lighting or visual confusion, thermal plume effects, and wildlife hazard.
- 6. The Site lies broadly between **Cotswold Airport/Kemble and RAF Fairford, approximately 7.8 km east of Kemble and 10.8 km west-south-west of RAF Fairford**. Cotswold Airport/Kemble and RAF Fairford both have runways aligned broadly east west, but not in close proximity to either runway threshold. The **grass strip aerodromes of Oaksey Park and South Cerney are approximately 6km to the south-west and approximately 3km to the north-west respectively**. Appendix A provides the locations of the aerodromes in the context of the Site.

11. Cotswold Airport/Kemble has published missed approach procedures which, in the Runway 08 direction¹, have the potential for aircraft to be directed in closer proximity to the Site, passing approximately 310 m east of it. However, a missed approach is not a routine circuit or normal training flightpath. It is a contingency procedure flown where an aircraft conducting an approach cannot continue to land, for example, due to weather, runway occupancy, an unstable approach, or another operational reason. While such procedures may be flown for instrument training or currency, they are not expected to form a routine element of flying-school circuit training. In any event, aircraft using the Runway 08 missed approach would be established in the climb out from the runway and would be at an altitude high above the level of the site, most likely between 425m and 510 m above ground level.

15. The flare stack is approximately 9m tall and typically heat dissipates to approximately 50 degrees centigrade at around 9m above the stack, and to ambient temperature (5-10°C) at potentially 12m above. As such, the thermal plume is both localised and intermittent in nature, and flying activity linked to either aerodrome would be significantly distanced from it even in the event of a missed approach procedure.

19. In conclusion, the Site is sufficiently low level and distant from both Cotswold Airport/Kemble and RAF Fairford and the local aviation sites at Oaksey Park and South Cerney that it does not sit within the routine low-level operating environment of any of these aerodromes. Other than the Kemble Runway 08 missed approach, which passes a few hundred metres east of the Site and would be flown well above the proposed infrastructure, no relevant circuit, approach, departure or training pattern has been identified close to the Site. The presence of Oaksey Park and South Cerney has therefore been considered as part of the aviation baseline, but neither is considered to give rise to a material aviation safety concern.

Notes: bold font highlights the four airfields of potential concern.

- 1.1.6 WCC received an email from Ministry of Defence, Defence Infrastructure Organisation (12 June 2026) with the following request for investigation into potential impacts of the Combined Heat and Power Plant (CHP):

“Can the developer please provide data from dispersion modelling to assess impact from the CHP stack. This is to assess any potential impact of emissions from the proposed stack in terms of turbulence and visual impairment to pilots.”

- 1.1.7 This Air Quality Technical responds to the MOD request and considers:

- Plume visibility due to condensed water
- Plume visibility due to particulate matter, and
- Turbulence due to the CHP plume.

2 Analysis

2.1 CHP source and emissions data

2.1.1 The AD Plant would have 2 no. CHPs, each 1,200kWe (kilowatts of electrical output). The CHPs will exhaust at 150°C. To conservatively assess the potential for turbulence from the stack, a CHP running on natural gas with higher volume flow rate than if it were run on biogas, has been modelled.

2.1.2 Table 2 shows the source and emission parameters for the CHP used within the modelling.

Table 2 CHP source and emission parameters

Parameter	Units	CHP (NG)
Location	X, Y	404068, 196068
Fuel	-	Natural gas
Electrical output	kWe	1,200
Stack height	m	8.7
Internal diameter at exit	m	0.4
Volume flow rate (dry)	Nm ³ /s	1.19
Volume flow rate (wet)	Am ³ /s	2.51
Velocity	m/s	20.0
Temperature	°C	150
Water content of plume by volume	%	10%
Mixing ratio	kg H ₂ O/kg dry release	0.071
Notes: Details of the calculation of emissions and assumptions made are given in Appendix C, Section C.1		

2.2 Plume visibility, condensed water

2.2.1 The ADMS 6 dispersion model¹ was used to calculate the number and length of visible plumes in one year (2017). Results showed that there were no visible plumes predicted due to the CHP in the year of meteorological data modelled, 2017. This is as expected as the exhaust temperature is above 100°C (150°C) and the amount of water in the plume at release is low, 10% by volume, equivalent to a mixing ratio (used by ADMS 6) of 0.071 kg/kg.

Plume visibility due to condensed water will not be an aviation safety risk.

2.3 Plume visibility, particulate matter

2.3.1 Small particles such as PM_{2.5} (fine particulate matter, with diameter less than 2.5µm) can cause a haze and hence affect visibility. The CHPs will be fired on gaseous fuels, natural gas and biogas, and the products of combustion are gaseous: nitrogen dioxide, carbon monoxide, volatile organic compounds and, when firing on biogas, sulphur dioxide. No fine particulate matter will be emitted.

Plume visibility due to particulate matter will not be an aviation safety risk.

¹ CERC, ADMS 6, Available at: <https://www.cerc.co.uk/environmental-software/ADMS-model.html> [Accessed: 22 June 2026]

2.4 Turbulence due to the CHP plume

- 2.4.1 When a *passive* (no momentum, no buoyancy) plume is emitted from a stack, it is affected by the (mean) wind speed and spread due to turbulence in the atmosphere.
- 2.4.2 Plumes with momentum and/or buoyancy, such as the CHP plume, have enhanced spreading due to enhanced turbulence.² The initial momentum will tend to have a near-field effect, primarily increasing the plume centreline height, while the buoyancy will tend to have a longer range effect increasing the plume centreline height and turbulence, until the plume approaches the temperature of the ambient air.
- 2.4.3 When a plume leaves the stack (diameter 0.4m) mechanically generated turbulence due to surface friction will be small in scale (less than 0.4m) and will dissipate with distance from the stack.
- 2.4.4 The ADMS 6 model does not output the additional turbulence due to the plume's buoyancy and momentum, but plume spread (σ_y lateral spread, σ_z vertical spread) is output. Figure 2 compares the plume height and vertical plume spread of the plume with and without plume rise under three meteorological conditions referred to by the Pasquill classes B, D and F. Neutral conditions, D, are the most commonly occurring in the UK:
- B (convective), wind speed 2m/s, surface sensible heat flux 84W/m²
 - D (neutral) wind speed 5m/s, surface sensible heat flux 0W/m², and
 - F (stable) wind speed 2m/s, surface sensible heat flux -6W/m².
- 2.4.5 The release without plume rise was modelled at a height of 30m in order to make a like-for-like comparison of plume spread, as plume spread due to atmospheric turbulence varies with height. The plots in Figure 2 show the difference in vertical plume with and without plume rise is small compared with the total plume rise.
- 2.4.6 Figure 3 shows the annual mean temperature at heights of 0m, 10m, 20m and 30m, across a domain 500m from the CHP in all directions i.e. covering the potential missed approach location. The plume signature is evident at 0m, partly evident at 10m and by 40m all values in the domain are equal and cannot be plotted.
- 2.4.7 The plots show that enhanced temperature and plume spread, a measure of plume induced turbulence, are not significant at 310m from the plume and certainly not at 425m to 510m above the ground.

For the missed approach procedure for Cotswold Airport/Kemble, in the Runway 08 direction¹, when aircraft may pass approximately 310 m east of the Site at an altitude of between 425m and 510 m above ground level, there would be no impact due to turbulence caused by the plume.

² University of Surrey (AG Robins), National Power (D D Aspley) and CERC (2025) Plume Rise Module Specification, P11/02R/25, Available at: https://www.cerc.co.uk/environmental-software/assets/data/doc_techspec/P11_02.pdf [Accessed: 22 June 2026]

3 Conclusion

- 3.1.1 An assessment has been carried out of the potential impact on aviation safety of the plume emitted from the 1,200kWe CHP, part of the Proposed Development at Ashton Keynes.
- 3.1.2 Impacts due to plume visibility (condensed water, plume visibility (particulate matter) and plume turbulence have been considered.
- 3.1.3 The assessment concluded that neither visibility nor turbulence due to the CHP would cause a negative impact to pilots.

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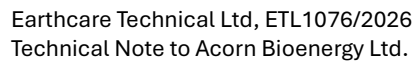


Figure 2 Plume height (top) and vertical plume spread (σ_z) with and without plume rise under a range of meteorological conditions: B (convective), D (neutral) and F (stable)

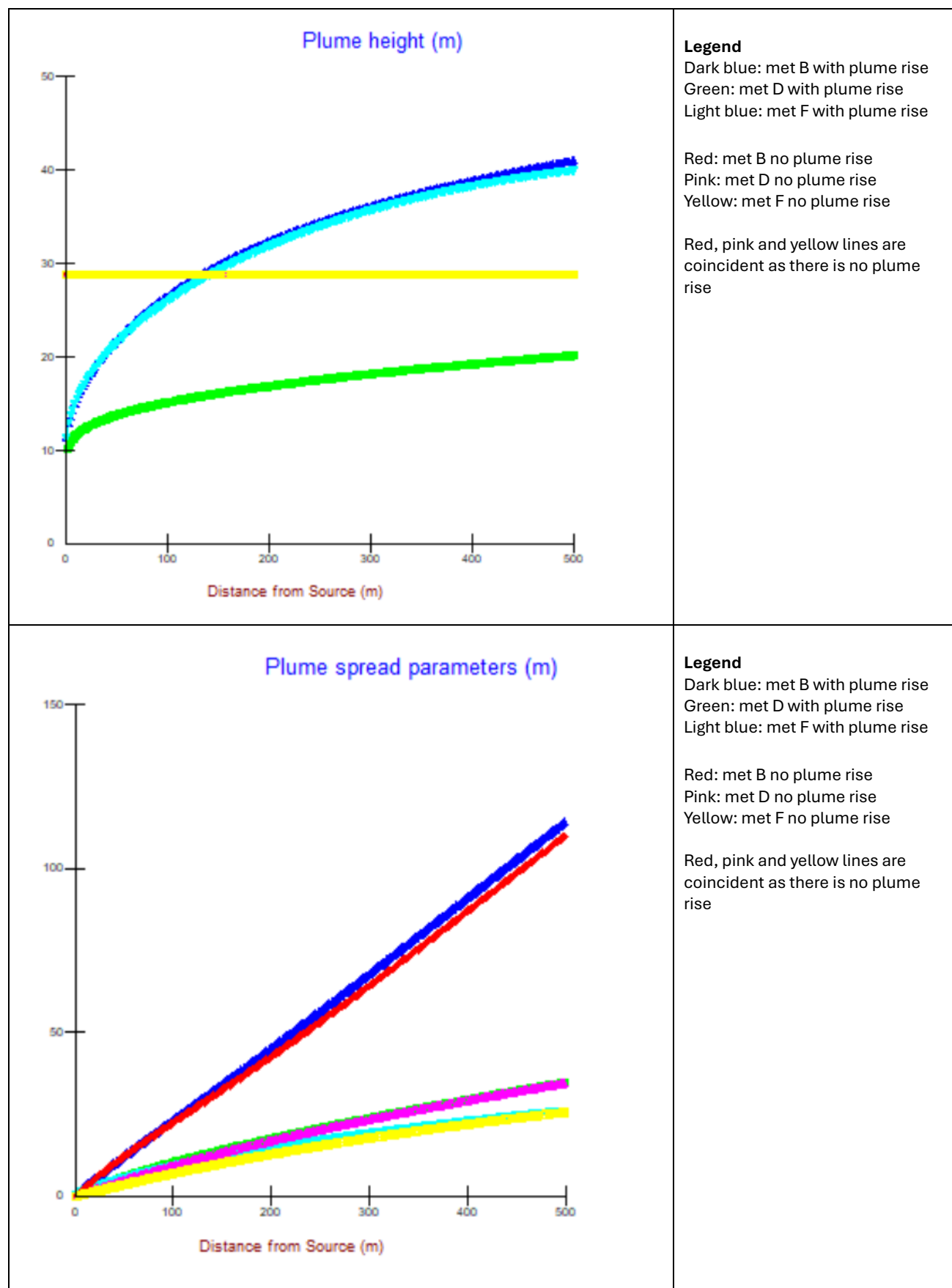


Figure 3 Contour plots of annual mean temperature (degC) at heights of 0m (top left), 10m (top, right), 20m (bottom left) and 30m (bottom right)

