

BV Dairy

QUALITATIVE BIOAEROSOL RISK ASSESSMENT FOR
ENVIRONMENTAL PERMIT EPR/HP3492EZ

Introduction

This qualitative assessment of bioaerosol risks relates to the potential exposure due to Blackmore Vale Farm Cream Limited's ("BV Dairy's") operations undertaken by environmental permit EPR/HP3492EZ. This risk assessment should be read in conjunction with the report 'Bioaerosol Monitoring' dated January 2025, ref: 117212 V1.

BV Dairy produces a range of soft cheese, cultured creams, yogurt, clotted cream and mascarpone for manufacturers, retail outlets and wholesale suppliers. In 2010, BV Dairy commissioned the Anaerobic Digester ("AD") plant that is the subject of this risk assessment. The plant was designed to use the factory effluent within the AD process to generate electricity and provide heating to the digester.

The plan is fed from the main factory via underground pipework to sealed holding tanks. From these holding tanks the effluent is fed into the digester, again via sealed pipes. Once the digestion process is completed the digestate is fed, again in sealed pipework, to covered separation tanks where the digestate is separated from the liquid effluent. The liquid effluent is then discharged via a 1.8m diameter sump through underground pipes into the Wessex Water foul drainage system, under a Consent to Discharge. The resultant digestate sludge is then pumped through sealed pipework to a holding tank from where it is removed by articulated suction tanker for deployment to land.

The site is located some 200-220m distant from domestic housing located on an arc from the Southwest to Northwest of the site. These developments are the eastern fringes of the town of Shaftesbury whose centre is some 1.4Km to the West of the site. Higher Wincombe Farm lies 340m to the North and consists of a collection of farm buildings and residential accommodation in open countryside. Langdale Farm lies 400m to the South. To the southeast a small agricultural buildings are 180m distant. Two footpaths are adjacent to the main factory, one lying 20m to the West and the other 150m to the North.

The site operates 24 hours per day, 365 days per year. The process is fully automatic, feeding effluent onto the plant and managing the removal of digestate and effluent.

1. Risk Screening

Risk screening is essentially an early stage in this assessment and has been undertaken to identify the existence of potential hazards and receptors. No account is taken of the existence or non-existence of pathways or mitigation measures and the probability of consequences is assumed to be absolute. Hazards related to the lagoon operation are:

Hazard from operation of the site.

Releases of bioaerosol into the atmosphere.

Potential consequences:

Effects on human health;

Quality of life – nuisance and effects on property;

Effects on water, air, soil, plants and animals.

Sensitive receptors associated with the site are detailed in Table 2.1.

Table 2.1 Sensitive Receptors

Receptor	Land use	Direction from site	Approximate distance to site boundary (m)	Sensitivity to emissions
Footpath W	Track	West	20	Low
Footpath N	Track	North	150	Low
Great Ground	Houses	West	200	High
Maple Close	Houses	Southwest	200	High
Blackmore Road	Houses	Northwest	220	High
Higher Wincombe Farm	Houses	North	340	High
Langdale Farm	House	South	400	High

The Risk Identification Matrix, Table 2.2, identifies the risks associated with the AD Plant. The matrix includes the sensitive receptors associated with the site identified in Table 2.1.

Table 2.2 Risk Identification Matrix

Specific Receptors	Activities associated with potential hazards	
	Operation	Storage
Domestic dwellings (<250m)	X	X
Domestic dwellings (>250m)	X	X
Public footpath or Bridleway	X	X

2. Potential hazards to Health from bioaerosols

Potential hazards to human health are summarised in Table 3.1. Research suggests activities associated with direct handling of materials are likely to be the most significant source of bioaerosols. Secondary sources include emissions from the lagoon.

Table 3.1 Conceptual model for health exposure assessment to bioaerosols

Primary source	Secondary source	Health hazard	Transport mechanism	Pathway	Medium of exposure	Receptor
Separation tank operation.	Release of breakdown products prior to storage of digestate.	Lung disease, allergies, irritation of mucus membranes, asthma	Carried with airborne moisture.	Inhalation via nose or mouth.	Air	Humans: Residents, occupiers and users of facilities.
		Fever, headache, diarrhoea, systemic infection		Ingestion – eating or swallowing	Air & deposited materials	
		Irritation of eye and mucus membranes, skin infection.		Absorption: Direct contact with airborne bioaerosol	Air & deposited materials	
				Indirect contact via clothing or surfaces		
		Skin infection, irritation of mucus membranes		Contact with eyes or skin	Air	

Table 3.1 lists the most likely effects to health. A wide range of health effects is possible from almost any exposure route.

3. Magnitude of Consequences

The magnitude of the potential consequences that the identified hazard represents are classified dependent upon a) the degree of the impact that the potential risk could have and b) the context in which the risk is being assessed.

Five categories from *negligible* to *extremely severe* are suggested by DEFRA as follows:

Table 4.1 DEFRA Risk Assessment Consequence Categories

Negligible	Sub lethal effects in individuals that do not cause a change in population or size.
Mild-Moderate	Effects occurring at the population level. Effects on ecosystems that are not regarded as being of high value for whatever reason.
Severe	Some lethal effects on individuals with effects on population structure and size. Regionally important ecosystems affected.
Very Severe	Local extinction (depending on the species) and local dysfunction of communities and ecosystems.
Extremely Severe	Global Extinction (depending on the species) and widespread effects on the functioning of communities and ecosystems.

4. Generic Down Wind Concentrations

Using general generic categories for potential scales of releases and apportioning four cases of operation.

Table 5.1 Generic Release Categories

Low Case	AD Plant with enclosed pipework and storage tanks. Liquid/sludge feedstock
Moderate Case	AD Plant with agri crop feedstock and enclosed loading operations.
High Case	Small scale AD Plant with agri crop feedstock and unsealed loading operations.
Very High Case	Large scale AD Plant with agri crop feedstock and unsealed loading operations.

In reviewing the activities undertaken at the site it is considered that only the low and moderate cases need to be considered for the lagoon.

5. Assessment of the Magnitude of Consequences

Site specific factors will influence the assessment of the magnitude of consequences. Exposure concentration is a product of source emission rate, dispersion and decay.

Source emission rate – Depending upon the activity being undertaken the rate of emissions will vary. It is not considered that as a liquid/sludge the rate of emissions will be high, due to the liquid content. The Bioaerosol Report measurements and results reinforce this conclusion.

Dispersion -There is a correlation between distance from the source to the receptor in the magnitude of exposure.

Decay – Micro-organisms are killed on exposure to ambient environmental conditions.

Concentrations have been estimated for the potential sensitive receptors in Table 2.1. The magnitude of consequences is expressed in risk terms (using the criteria in Table 4.1) and shown in Table 6.1

Table 6.1 Potential Magnitude of Consequences (Exposure Concentrations)

	Emission case from operation and storage			
Receptor	Very High	High	Moderate	Low
Footpath W	n/a	n/a	n/a	Negligible
Footpath N	n/a	n/a	n/a	Negligible
Great Ground	n/a	n/a	n/a	Negligible
Maple Close	n/a	n/a	n/a	Negligible
Blackmore Road	n/a	n/a	n/a	Negligible
Higher Wincombe Farm	n/a	n/a	n/a	Negligible
Langdale Farm	n/a	n/a	n/a	Negligible

6. Assessment of the Probability of Occurrence

When considering the potential for the probability of occurrence further factors combine to reduce occurrence from initial estimates as follows:

Receptor occupancy. – The proportion of the time the receptor is present at the identified location. Clearly this is higher for residential property than for agricultural premises.

Wind direction – The proportion of the time that the wind blows towards the receptor. The predominant wind direction for RNAS Yeovilton is from the South West through to the South, therefore away from the residential dwellings.

Frequency of release events - Factors as contained within Table 5.1.

When these are combined with the emission cases for the operations, the risk of bioaerosol exposure is identified at Table 7.1.

Table 7.1 Significant risk of Bioaerosol exposure at identified receptors

	Emission case from operation and storage			
Receptor	Very High	High	Moderate	Low
Footpath W	n/a	n/a	n/a	Negligible
Footpath N	n/a	n/a	n/a	Negligible
Great Ground	n/a	n/a	n/a	Negligible
Maple Close	n/a	n/a	n/a	Negligible
Blackmore Road	n/a	n/a	n/a	Negligible
Higher Wincombe Farm	n/a	n/a	n/a	Negligible
Langdale Farm	n/a	n/a	n/a	Negligible

From Table 7.1 the potential risks from the AD Plant operations would be likely to be as follows:

For all operations and at all times the risk to residents and users of the tracks are acceptable and are negligible.

The need for additional technical or design measures to reduce potential bioaerosols releases is not indicated.