AMBIENT BIOAEROSOLS MONITORING

Cribbs Causeway

Prepared for: Advetec Holdings Ltd

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APPENDICES

1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by Advetec holdings Ltd (Advetec) to undertake Ambient bioaerosol monitoring within and on the Permit Boundary of a newly installed Aerobic Digester (AD) at Cribbs Causeway, (the 'Site'). This report presents the results obtained from the monitoring campaign undertaken on the 7th October 2021.

1.1 Site Background

The Site is located in an industrial location approximately 8km north of Bristol. The area surrounding the Site is predominantly industrial land and associated Cribbs Causeway shopping centre (a commercial shopping centre).

The AD unit receives solid food and general waste biproducts from the Site. During treatment, the volume, mass, and moisture content of the waste is reduced, enabling easier handling of the product during export from the Site.

1.2 Scope and Objectives

The objective of the study was to first quantify the bioaerosol emissions from the digestion process, followed by investigation of the likely on and offsite impact of the operations. The offsite impact assessment will be described on a separate report following an air dispersion modelling study.

In summary, the scope of this report consists of the following:

- Description of sampling and monitoring methodology for bioaerosols;
- presentation of results;
- comparison of results against COSHH WELs; and
- observations and conclusions.

2.0 HYGIENE STANDARDS

2.1 Control of Substances Hazardous to Health (COSHH) regulations

Currently there is no Health and Safety Executive limit on occupational bioaerosol exposure, however, it is important for employers to monitor bioaerosol levels at facilities to ensure compliance with the Control of Substances Hazardous to Health (COSHH) regulations[1].

After research was carried out by operators in the United Kingdom, an *Upper Assessment Threshold* value of 500,000 cfu/m^3 was set for Total Microorganisms (Total Bacteria + Total Fungi). As well as the Upper Assessment Threshold, two further levels were established: the *Internal Trigger Level*, set at 50,000 cfu/m^3 and the *Internal Control Level*, set at 10,000 cfu/m^3. These thresholds are summarised in Table 2-1 below.

Table 2-1
Applicable Hygiene Standards

Assessment Threshold Levels	
Internal Control Level	10,000 cfu/m^3
Internal Trigger Level	50,000 cfu/m^3
Upper Assessment Threshold	500,000 cfu/m^3

Advanced investigation will be required when the *Internal Control Level* is exceeded and actions to reduce biological agents entering the body should be taken upon exceedances of the *Internal Trigger Level*.

2.2 Environment Agency – Technical Guidance Note (Monitoring) M9

The Environment Agency Technical Guidance Note (Monitoring) M9[2] provides a standardised approach for bioaerosols monitoring for both ambient and point source emissions. M9 sets a limit of 1,000 CFU/m^3 for Total mesophilic bacteria, and a limit of 500 CFU/m^3 for Aspergillus fumigatus.

[1] Control of Substances Hazardous to Health Regulations (COSHH) 1994.
[2] Technical Guidance Note (Monitoring) M9, Environmental monitoring of bioaerosols at regulated facilities, July 2018.

3.0 METHODOLOGY & APPROACH

3.1 Bioaerosol Sampling Approach

Monitoring for bioaerosol was undertaken using fixed place, static monitoring to determine general ambient levels. Monitoring was undertaken during the day of the 7th October 2021.

3.1.1 Static Monitoring

Bioaerosols monitoring was undertaken in general accordance with Methods of Determination of Hazardous Substances (MDHS) 14/4[3] *'General methods for sampling and gravimetric analysis of respirable, thoracic and inhalable aerosols'*.

The samples were collected using a 25mm polycarbonate filter attached to an Institute of Occupational Medicine (IOM) sampling head. The sampling head was mounted at breathing height where practicable and attached to a calibrated personal sampling pump. The pump was set to a rate of 2.0l/min (+/-0.1l/min). Sampling pumps were calibrated before and after monitoring using an SKC 393-0334 rotameter, serial no. 14533442.

Monitoring was undertaken for approximately 60 minutes and samples were sent to a UKAS accredited laboratory for analysis where Total Mesophilic Bacteria (Total Viable Count - TVC) and Aspergillus Fumigatus concentrations were obtained.

3.2 Monitoring Locations

Monitoring locations were defined and agreed in principle prior to the monitoring date and adjusted slightly on the day of the sampling visit. All monitoring locations were static, predominantly sited around the digestor and the outlet of the Odour Control Unit (OCU). Further locations were sited in front of the Local Extraction Ventilation (LEV) system. A summary of the monitored locations is listed in Table 3-1 and presented in Figure 3-1. Monitoring location photos can be found in Annex B.

Table 3-1
Monitoring Locations

Location No.	Details
1	LEV Location 1
2	LEV Location 2
3	LEV Location 3
4	Permit boundary – West of product bin
5	Permit boundary – Northwest of product bin
6	Carbon filter outlet
7	Permit boundary – North of digestion chamber
8	Permit boundary – East of loading hopper (raw waste input)
9	Permit boundary – South of digestion chamber
10	Permit boundary – Southwest of product bin

[3] Health and Safety Executive. *MDHS 14/4 General methods for sampling and gravimetric analysis of respirable, thoracic and inhalable aerosols*. 2014.

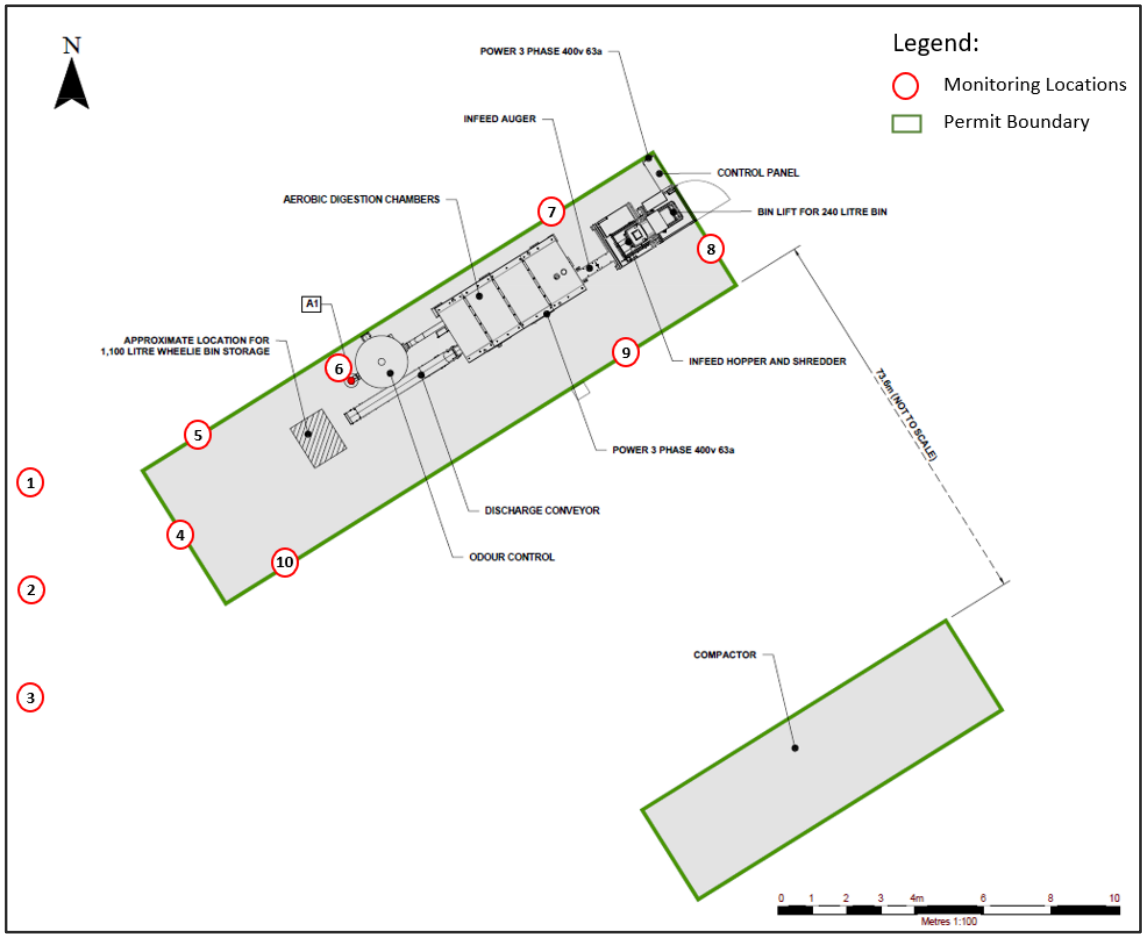

Figure 3-1
Monitoring Locations

Further details of the monitoring locations are listed below in Table 3-2. Sample numbers have been displayed in order of sampling time.

Table 3-2
Aerobic Digestion Facility Monitoring Details

Location		IOM Head ID.	Pump ID	Run Time (hr:min)	Flow (l/min)	Volume (L)
No.	Details					
4	Permit boundary – West of product bin	14	AQ0004	01:00	2.0	120
5	Permit boundary – Northwest of product bin	4	AQ0005	01:00	2.0	120
6	Carbon filter outlet	7	AQ0002	01:00	2.0	120
9	Permit boundary – South of digestion chamber	11	AQ0003	01:00	2.0	120
10	Permit boundary – Southwest of product bin	16	AQ0001	01:00	2.0	120
1	LEV Location 1	12	AQ0004	01:00	2.0	120
2	LEV Location 2	2	AQ0005	01:00	2.0	120
3	LEV Location 3	9	AQ0002	01:00	2.0	120
7	Permit boundary – North of digestion chamber	1	AQ0003	01:00	2.0	120
8	Permit boundary – East of loading hopper (raw waste input)	5	AQ0001	01:00	2.0	120

3.3 Site Operations

The following notes and observations were made regarding operations during the monitoring to provide Advetec with context to the results:

- The AD unit was loaded approximately 1 hour prior to commencement on the monitoring and was fully operational throughout the duration of the monitoring period. The unit was loaded once during the monitoring period.
- There is currently a build up of raw, general waste and food waste. This may have impacted the results for both analytes from Location 5, 7 and 8. Photo examples of the build up can be found in Annex B.
- The LEV system was not operational during the monitoring period due to maintenance of the fire alarm system.
- The carbon filter media was replaced approximately 3 months prior to the monitoring date.

4.0 RESULTS

Monitoring was undertaken during the day on the 7th October 2021. The weather during the monitoring period was overcast and dry. Monitored concentrations of TVC and Aspergillus Fumigatus are presented in Table 4-1 below, with the laboratory reports included within Appendix A.

Table 4-1
Ambient Bioaerosol Results

Location		Start Time (hh:mm)	End Time (hh:mm)	TVC (cfu/m^3)	Asp. Fumigatus (cfu/m^3)
No.	Details				
4	Permit boundary – West of product bin	09:30	10:30	< 8	< 8
5	Permit boundary – Northwest of product bin	09:30	10:30	24	< 8
6	Carbon filter outlet	09:30	10:30	48	< 8
9	Permit boundary – South of digestion chamber	09:30	10:30	< 7	< 8
10	Permit boundary – Southwest of product bin	09:30	10:30	< 8	< 8
1	LEV Location 1	10:41	11:41	< 8	< 8
2	LEV Location 2	10:41	11:41	< 8	< 8
3	LEV Location 3	10:41	11:41	< 8	< 8
7	Permit boundary – North of digestion chamber	10:41	11:41	< 8	< 8
8	Permit boundary – East of loading hopper (raw waste input)	10:41	11:41	< 8	< 8
* Results for Aspergillus Fumigatus for all locations were below the LOD of 8 cfu/m^3.					

5.0 BIOAEROSOLS RISK ASSESSMENT

The Environment Agency Technical Guidance Note M9 states the following in relation to bioaerosols risk assessment:

1. Scope

[…]

Bioaerosol monitoring can have a role to play in environmental risk assessment, and in assessing whether the control measures in place at a facility are maintaining bioaerosols at acceptable levels. We will include bioaerosol monitoring requirements as an environmental permit condition, where appropriate."

This section will review the monitoring data in conjunction with the M9 regulatory limits and COSHH trigger levels.

5.1 Onsite Risk Assessment

On review of the monitoring data in Section 4.0, the results show that for all locations, the concentrations of TVC and Aspergillus Fumigatus were below the respective regulatory limits and trigger levels listed in Section 2.0 during the monitoring period.

5.2 Offsite Risk Assessment

On review of the monitoring data in Section 4.0, the results show that for all LEV locations, the concentrations of TVC and Aspergillus Fumigatus were below the respective regulatory limits and trigger levels listed in Section 2.0 during the monitoring period. Therefore, the offsite impact in terms of bioaerosols emissions on nearby receptors in considered negligible.

5.3 Mitigation

The following measures have the objective of reducing/maintaining low bioaerosol emissions resulting from the AD operations:

- A high level of site cleanliness will be maintained (i.e. spillages are to be cleared on an ad-hoc basis and not left in situ).
- The level of raw waste build-up (i.e. waste that has not been inputted into the shredder for treatment) will be kept to a minimum at all times.
- A proactive approach to carbon media replacement. Carbon media should be tested to establish an appropriate replacement frequency. Media should then be replaced before saturation occurs.

6.0 CONCLUSIONS

The enclosed laboratory results (seen in Appendix A) indicate that at the time of sampling:

- Results for Total Viable Count (TVC) did not exceed the Internal Control Level at any of the monitored locations.
- Results for Aspergillus Fumigatus did not exceed the Internal Control Level at any of the monitored locations.
- Results for Total Viable Count (TVC) did not exceed the ambient air bioaerosol concentration limit of 1,000 cfu/m^3 set by the Environment Agency at any of the monitored locations.
- Results for Aspergillus Fumigatus did not exceed the ambient air bioaerosol concentration limit of 500 cfu/m^3 set by the Environment Agency at any of the monitored locations.

APPENDIX A

Laboratory Analysis Reports

SOUTHERN MICROBIOLOGICAL SERVICES LTD
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HP18 9PH

TEST REPORT

Report Reference: 1211000973
Date Reported: 11 October 2021
Page 1 of 2

SLR Consulting Ltd Environmental Filters PO: 416-5651

SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	TVC cfu/m3 (2 day pr	Asp fumigatus cfu/m3
1211007174	07/10/21	4	On: 09:30 Off: 10:30 2L/m	120	---	< 8 cfu/m3	< 8 cfu/m3
1211007175	07/10/21	5	On: 09:30 Off: 10:30 2L/m	120	---	24 cfu/m3	< 8 cfu/m3
1211007176	07/10/21	6	On: 09:30 Off: 10:30 2L/m	120	---	48 cfu/m3	< 8 cfu/m3
1211007177	07/10/21	9	On: 09:30 Off: 10:30 2L/m	120	---	< 7 cfu/m3	< 8 cfu/m3
1211007178	07/10/21	10	On: 09:30 Off: 10:30 2L/m	120	---	8 cfu/m3	< 8 cfu/m3
1211007179	07/10/21	1	On: 10:41 Off: 11:41 2L/m	120	---	< 8 cfu/m3	< 8 cfu/m3

SLR Consulting Ltd Environmental Filters PO: 416-5651

Report Reference: 1211000973
Date Reported: 11 October 2021
Page 2 of 2

SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	* TVC cfu/m3 (2 day pr	* Asp fumigatus cfu/m3
1211007180	07/10/21	2	On: 10:41 Off: 11:41 2L/m	120	---	< 8 cfu/m3	< 8 cfu/m3
1211007181	07/10/21	3	On: 10:41 Off: 11:41 2L/m	120	---	< 8 cfu/m3	< 8 cfu/m3
1211007182	07/10/21	7	On: 10:41 Off: 11:41 2L/m	120	---	8 cfu/m3	< 8 cfu/m3
1211007183	07/10/21	8	On: 10:41 Off: 11:41 2L/m	120	---	< 8 cfu/m3	< 8 cfu/m3

Unless otherwise indicated, all samples were received in good condition, tests were performed at the above address and results apply to the sample as received. Date tested equals date received.

Re-issued report with PO No.

Carol Macready
Technical Administration Manager

* Tests marked with a * in this report are not included in the UKAS Accreditation Schedule for our laboratory

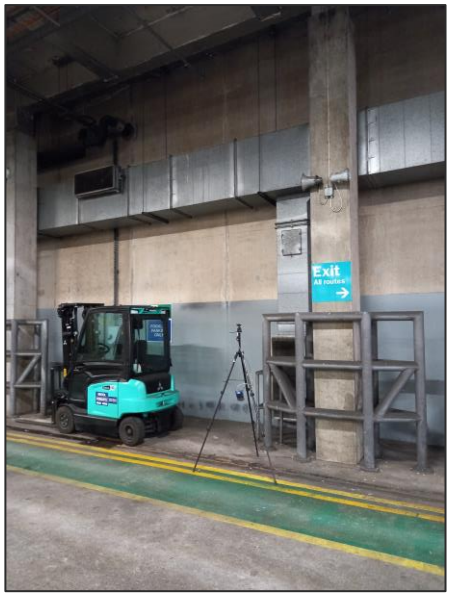
APPENDIX B

Monitoring Locations

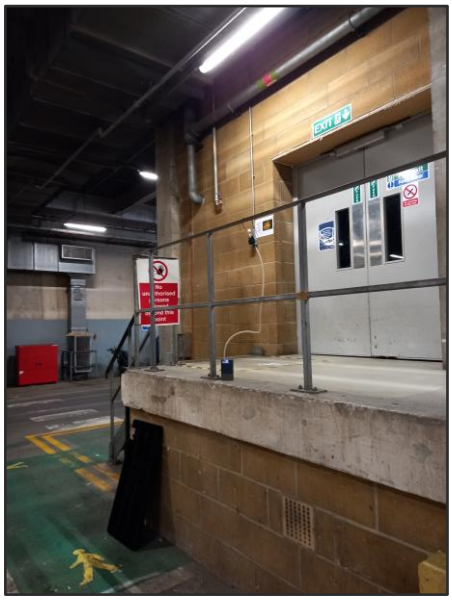
LEV Location 1

LEV Location 2

LEV Location 3

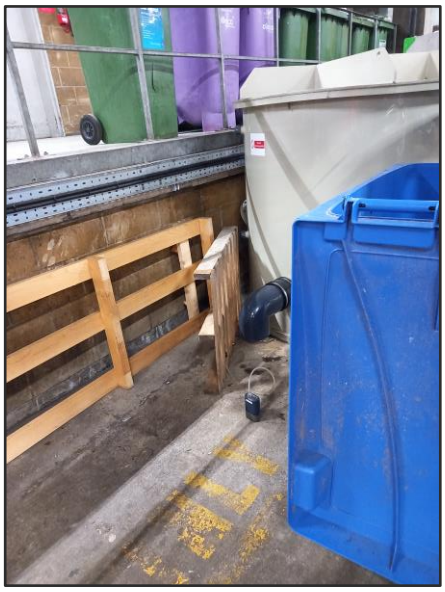


Permit boundary – West of product bin



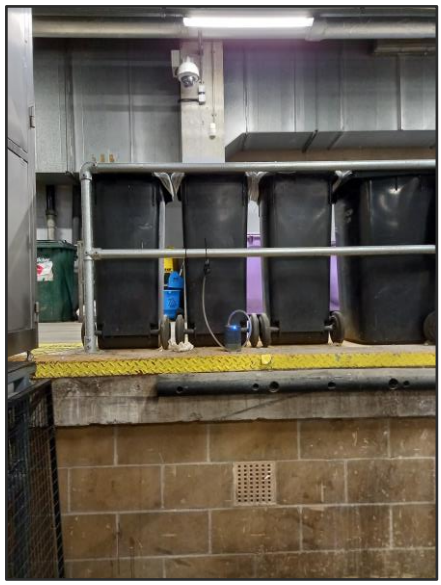
Permit boundary – Northwest of product bin

Carbon filter outlet

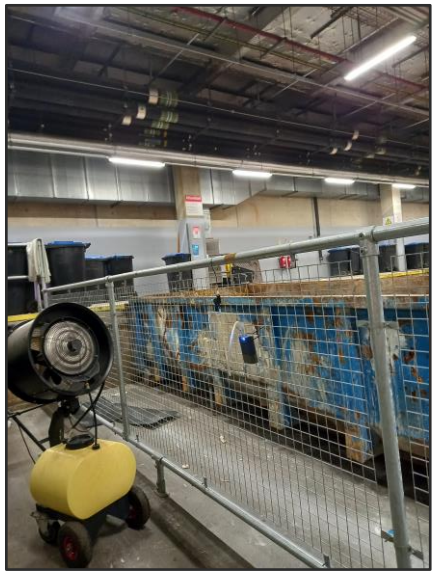


Permit boundary – North of digestion chamber

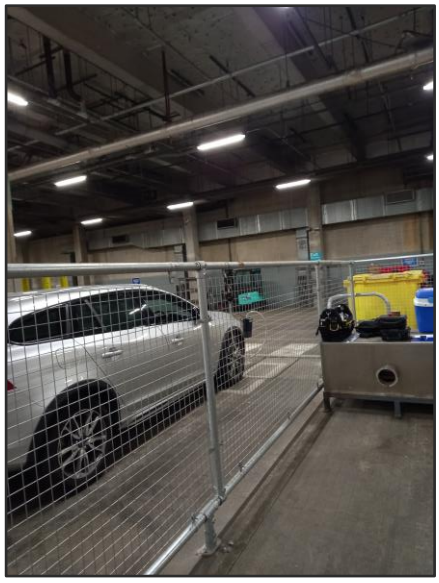
Permit boundary – East of loading hopper (raw waste input)



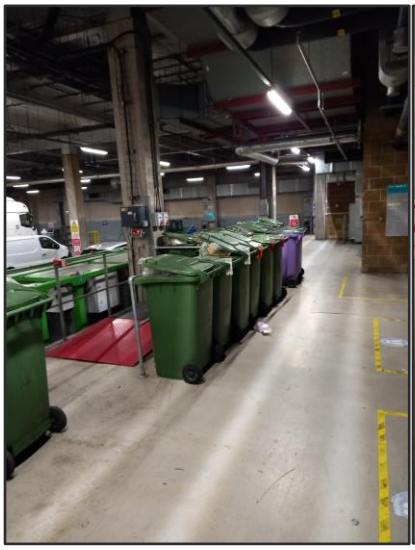
Permit boundary – South of digestion chamber

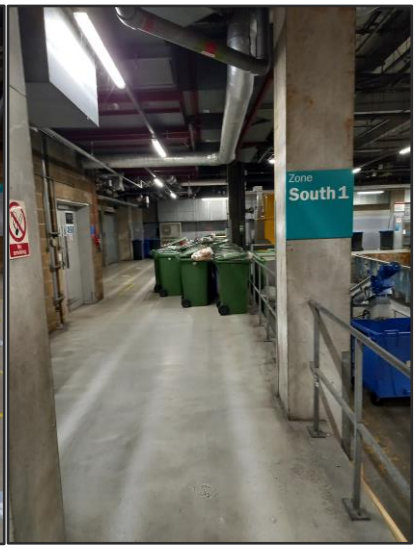


Permit boundary – Southwest of product bin



General/food waste build up





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