Bioaerosol Sampling Report 2020

FCC Environment

Bryn Lane MBT (Phase 2)

6th August 2020

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Approval Sheet

Customer:	FCC Environment
Site:	Bryn Lane MBT, Wrexham Recycling Park, Bryn Lane, Wrexham LL13 9UT
Project title:	Bioaerosols Sampling
Project Manager:	I. Castezubi
Project Staff:	I. Castezubi, A. Hammersley, A. Lovell, T. Ross
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Issue	Status	Date	Prepared By	Signature	Date
1	Final	27/08/2020	T. Ross		26/08/2020
			Approved By	**Signature**	**Date**
			A. Hammersley		27/08/2020

Foreword

enitial has used its best endeavours, experience and expertise to provide a meaningful, accurate and relevant representation of the works carried out. The works were based on a defined programme and scope of works and terms and conditions agreed with the Client.

enitial cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outside the agreed scope of works.

This report is issued solely to the Client. enitial does not accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.

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Scope of Work

enitial was tasked with providing Bioaerosol monitoring for FCC Environment at Bryn Lane MBT facility (Phase 2) located at Wrexham Recycling Park, Bryn Lane, LL13 9UT.

Due to the complex layout and proximity of the site facility, an agreement has been made between the regulator Natural Resources Wales (NRM) and FCC Environment Ltd. This is an amendment to the standards by the Environment Agency Technical Guidance Note (Monitoring) M9 to produce a modified site strategy.

FCC agree with NRW that the nearest sensitive receptor to the MBT operation for sampling will be the HWRC, which are approximately 110-130m from the emission stack with the centre of the HWRC estimated to be 160-165m.

Due to the potential health risks posed by the facility to nearby receptors, the testing was conducted to assess the amount of airborne bioaerosols being generated by the site that is released into the local environment. The monitoring is to ensure that this exposure is below the industry standard threshold set by the Environmental Agency.

The work was carried out on 6th August 2020. This document is a presentation of the resulting data.

Background

The bioaerosol monitoring was specifically undertaken to enumerate the quantity of micro-organisms that can be cultured from representative samples of ambient air, collected at pre-determined monitoring points in the locality of the site.

The monitoring was undertaken in accordance with– Environmental monitoring of bioaerosols at regulated facilities – July 2018.

Pre-prepared agar sample plates for *Aspergillus fumigatus,* mesophilic micro-organisms (bacteria) were directly impacted with ambient air using an Andersen sampler at the four selected sampling locations.

In the UK no statutory limits have been set for ambient concentrations of bioaerosols. However, as per the Environmental Agency Technical Guidance Note M17, guideline levels have been set for acceptable levels at sensitive receptors as the following:

- Total bacteria: 1000 cfu/m^3
- Aspergillus Fumigatus: 500 cfu/m^3

Sampling Locations

The sampling locations were determined to achieve:

- One sampling location directly upwind of the centre of the MBT facility.
- One location directly downwind of the MBT facility.
- One location at the nearest sensitive receptor, being the HWRC facility.

Equipment

The equipment used is as follows:

- Continuous operation mobile weather station (wind speed, direction, temperature, humidity) and tripod
- Digital stopwatch
- GPS device
- 3 x single-stage Andersen samplers
- 3 x tripods
- 3 x hemicylindrical baffles
- 3 x stoppers for Andersen samplers
- 3 x fully charged vacuum pumps (individual capacity of at least 35l per min) and connecting tubing
- Rotameter to fit vacuum pump
- Agar plates – variety dependent on required test
- 2 x sealable airtight sterile plastic containers
- Cool box with ice packs for transport
- 70% v/v aqueous solution / wipes of ethanol or industrial methylated spirits cleaning solution or other suitable disinfectants

Agar

The types of Agar used were:

-Mesophilic micro-organisms: (Total Viable Count [TVC]) – Half Strength Nutrient Agar (also known as 93's – white in colour)

-*Aspergillus Fumigatus* / Total Fungi: (colony-forming unit [cfu]) – Malt Extract Agar (also known as 94's – light yellow in colour)

The impacted agar plates were subsequently delivered to a specialist laboratory within 24 hours via a cool box with ice packs where they were cultured and enumerated.

Cleaning of Sampling Equipment

All parts of the sampling equipment that were in contact with the samples, work surfaces or storage containers were cleaned with a 70% aqueous solution or wipes of ethanol or methylated spirits, or other suitable disinfectants prior to use. Equipment was completely dried, through air drying before the sampling exercise was commenced.

On completion of cleaning the Andersen single-stage samplers, a stopper was placed in the cone entrance to stop any contamination occurring before the sampling event.

Setup and Operation of Sampling Equipment

- The pumps were Pre-run for a specified time at the required flow rate of 28.3l/min (±2%). This pump test was undertaken once before the start of the monitoring exercise.
- The Andersen single-stage samplers were mounted on to the tripods securely at a height of 1.5-1.8m above ground and the baffles were fitted on the tripod to form a rear shield when aligned to the desired sampling direction.
- The vacuum pump was connected to the rotameter using an appropriate length and diameter of the tubing. Using the rotameter, the flow rate was adjusted to ensure it is running at a constant flow of 28.3l/min (±2%) for each pump.
- On completion of the pump test, the tubing from the dry gas flow meters was disconnected from the rotameter then connected to the inlet on the corresponding Andersen single-stage sampler.
- Fresh sample plates were installed in turn by removing the lid and being placed within the Andersen single-stage sampler
- The stoppers in the inlet of the Andersen single-stage samplers were removed.
- When the Andersen single-stage samplers were fitted with plates the vacuum pumps were activated and the start time recorded on the stopwatch. All pumps were switched on/off at the same time or at a maximum interval of up to 10% of the total run time.
- When the sample duration was completed the pumps were stopped and the finish time recorded.
- The plates were carefully removed ensuring that no contact was made with the exposed agar surface,
- The dish cover was replaced on to the plate and secured with masking tape.
- Each plate was placed into an individual plastic bag and sealed.
- The plates were stored in an upright, protective and cooled container and transported to the laboratory within 24 hours.
- Control blank samples were taken at the site. The steps stated above were adhered to however the sample pump was not switched on.

One of each sample media was inserted within the Andersen single-stage samplers, left in for the same period of sampling time, then packaged.

- Field blank samples were taken. The sample media were placed in re-sealable packaging without being opened.

The impacted agar plates were subsequently delivered to a specialist laboratory via a cool box with an ice pack. The analysis took place within 24 hours from sample collection.

Presentation of Data

The following pages consist of meteorological conditions found on site, a presentation of the estimated concentrations of airborne micro-organisms, a plan displaying sample locations and the laboratory data.

Bioaerosol Monitoring Field Sampling Report

Site: Bryn Lane MBT (Phase 2)

Site Operator: FCC Environment

Date: 6th August 2020

Start Time: 12:30
Finish Time: 13:30

Monitoring Technician ID: I. Castezubi, A. Hammersley, A. Lovell

Meteorological Monitoring Summary

Parameter	Wind Direction	Wind Speed (m/s)	Pressure (mb)	Temperature (°C)	Cloud Cover (0-8)
Start	SSE	2.68	1015	22	6
Finish	SSE	2.68	1015	22	6

Site Description

FCC Bryn Lane MBT facility is situated inside an industrial estate as part of Wrexham Recycling Park located on Bryn Lane, Wrexham.
The MBT facility was operating under normal conditions during the sampling period. The nearest sensitive receptor is the Wrexham Household Waste Recycling Centre situated approximately 150m from the MBT facility.

Field Sampling Comments

Samples were taken at an upwind, downwind location and at a sensitive receptor, as was agreed with FCC Environment, (see enclosed annotated image Bryn Lane MBT BioA study 06.08.2020) using Andersen samplers. Ambient air samples were collected by the technique of direct impaction, where a known quantity of air was directed onto an agar plate. The agar samples were then cultured and counted by a specialist laboratory. The count result provides a quantification of the potential health risks posed by the facility to nearby receptors. It was noted that a transient waste odour was present at all three sample locations during monitoring.

Upwind location: The upwind sample was located on the site boundary south of the MBT facility, placed on the edge of the car park. It was noted that tall vegetation was located near to the sampler location.

Downwind location: The downwind location was placed on a grass verge north of the MBT facility alongside the haulage road and on the boundary of the site perimeter.

Sensitive Receptor Location: The sensitive receptor location was placed on a grass verge beside the haulage road running past the boundary of the MBT with the HWRC. Regular traffic passed this location with a total of six vehicles passing during monitoring.

Deviations from methods

The locations were assessed to take into account the effect of features and obstructions which may impact the effectiveness of the monitoring. The sampling locations were restricted to where safe physical access was possible along with being legally accessible. (See enclosed annotated image "Bryn Lane MBT Aerial plan 06/08/2020").

Sampling locations were determined in agreement to the modified sampling strategy as agreed by the NRW regulator and FCC.

Field Sampling Record

Ambient Sampling: Estimated concentration of bioaerosols

Site: Bryn Lane MBT (Phase 2)

Sampling Date: 06/08/2020

Estimated Mass of Materials: Unknown

Activities affecting the concentration of Bioaerosols: MBT activities, biofilter stack

Site Operator: FCC Environment

Monitoring Contractor: Enitial

Type of Materials Processed on Site: Green Waste and Compost

Site Activity: Normal MBT operations

Location and grid reference	Sample reference number	Distance from centre of active area (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m³) **Total Count (TVC)**	Concentration of bioaerosols (CFU/m³) **Aspergillus Fumigatus (YM)**	Median of samples (CFU/m³)	
							TVC	**YM**
Upwind (1) SJ 38815 49826	UW001BIOAEM. Upwind location on site boundary, edge of car park.	83m	189.5°	12:37 – 12:42	812	-	812	7
				12:37 – 12:42	-	7		
				12:47 – 12:52	952	-		
				12:47 – 12:52	-	< 7		
				12:57 – 13:02	476	-		
				12:57 – 13:02	-	21		

Location and grid reference	Sample reference number	Distance from centre of active area (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m³) **Total Count (TVC)**	Concentration of bioaerosols (CFU/m³) **Aspergillus Fumigatus (YM)**	Median of samples (CFU/m³)	
							TVC	**YM**
Downwind (2) SJ 38746 49973	DW002BIOAEM. Downwind location on grass verge, near to haulage road.	88m	-3.5°	12:37 – 12:42	210	-	147	119
				12:37 – 12:42	-	7		
				12:47 – 12:52	147	-		
				12:47 – 12:52	-	133		
				12:57 – 13:02	63	-		
				12:57 – 13:02	-	119		
Sensitive Receptor (3) SJ 38756 50048	SR003BIOAEM. Sensitive receptor location on boundary of HWRC.	178m	-17.5°	12:37 – 12:42	980	-	980	301
				12:37 – 12:42	-	294		
				12:47 – 12:52	1120	-		
				12:47 – 12:52	-	301		
				12:57 – 13:02	616	-		
				12:57 – 13:02	-	497		

	Sample reference number	Distance from centre of active area (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m³) **Total Count (TVC)**	Concentration of bioaerosols (CFU/m³) **Aspergillus Fumigatus (YM)**	Median of samples (CFU/m³)	
							TVC	**YM**
Control	ControlBIOAEM At same location as Upwind	N/A	N/A	N/A	15	-	N/A	
					-	< 1		
Field	FieldBIOAEM Not removed from package. For QA/QC	N/A	N/A	N/A	127	-	N/A	
					-	< 1		

Field Sample Results

The median is routinely used for statistics and probability theory as the results are less likely to be skewed by extremely high or low values that are not representative of the data set. The median is located by finding the middle value by evenly separating the data set. The sensitive receptor median results have been calculated and are presented within this table. The process contribution has then been calculated by subtracting the upwind median value from the highest downwind median value. The process contribution shows the input the activity of the site has on the ambient bioaerosols concentrations. Where the median upwind value is higher than the median downwind value the process contribution may be expressed as a negative. In the table below the process contribution is shown.

Process Contribution Results				
Sample type	**Upwind median results**	**Downwind median highest results**	**Process Contribution**	**Sensitive Receptor**
Total Bacteria viable Count (TVC)	812	147	**-665**	980
Aspergillus fumigatus (YM)	7	119	**112**	301

Summary of Analytical Results

The above reports indicate that at the time of sampling:

1. Mesophilic micro-organisms - Total Viable Count (TVC) shows lower readings at the downwind location compared to the upwind location.

2. Aspergillus readings were detected at upwind, downwind and sensitive receptor sample locations.

3. Upwind location median results remained below the industry standard threshold values of 1000cfu/m^3 for Total Bacteria.

4. Downwind location median process contribution results remained below the industry standard threshold values of 1000cfu/m^3 for Total Bacteria.

5. Sensitive receptor location median results remained below the industry standard threshold values of 1000cfu/m^3 for Total Bacteria.

6. Upwind location median results remained below the industry standard threshold values of 500cfu/m^3 for Aspergillus Fumigatus.

7. Downwind location median process contribution results remained below the industry standard threshold values of 500cfu/m^3 for Aspergillus Fumigatus.

8. Sensitive receptor location median results remained below the industry standard threshold values of 500cfu/m^3 for Aspergillus Fumigatus.

9. Control and Field blanks for QA/QC did not show any significant levels of contamination.

Appendices

Appendix A - Aerial Plan

FCC Environment, Bryn Lane MBT (Phase 2), Bioaerosol Survey 06/08/2020
Aerial Plan Showing Bioaerosol Sample Locations

Appendix B – Meteorological Conditions

METEOROLOGICAL CONDITIONS

SITE:	Bryn Lane MBT (Phase 2)	SITE OPERATOR:	FCC Environment
SAMPLING DATE:	06/08/2020	COMMISSIONING LABORATORY:	Southern Microbiological Services
ESTIMATED MASS OF MATERIALS:	Unknown	TYPE OF MATERIALS PROCESSED ON SITE:	Compost and green waste

Location	Sample Reference Number	Bearing of samplers from boundary of operational area or turning/ screening operation (° from true north) - GPS	Mean direction the wind blows to during the sampling period (° from true north)	Difference in bearing between location of samples from boundary/ source and mean direction wind blows to (°)	Mean wind speed during sampling (m/s)	Arithmetic mean of air temperature (°C)	Arithmetic mean of relative humidity (%)
Upwind	UW001BIOAEM	148 SJ 38815 49826	337.5	189.5	2.68	22	72
Downwind	DW002BIOAEM	341 SJ 38746 49973	337.5	-3.5	2.68	22	72
Sensitive Receptor	SR003BIOAEM	355 SJ 38756 50048	337.5	-17.5	2.68	22	72

Appendix C - Photograph sheet

MONITORING PHOTOGRAPH RECORD **Ref:** BL20200806

Site: FCC Bryn Lane MBT (Phase 2) **Date:** 06/08/2020

Title: Bryn Lane Phase 2 Environmental Bioaerosol **Carried Out By:** AH / AL / IC

Upwind location 1 – Position of the upwind sampler facing the MBT facility

Upwind location 1 – Position of the upwind sampler facing away from the MBT facility

Downwind location 2 – Position of the downwind sampler, looking towards MBT facility Biofilters

Downwind location 2 – Position of the downwind sampler, looking away from the MBT facility Bio-filters

Sensitive Receptor location 3 – Position of the downwind sampler, looking towards the facility

Sensitive Receptor location 3 – Position of the downwind sampler, looking away from the facility

Appendix D – Laboratory Certificate

SOUTHERN MICROBIOLOGICAL SERVICES LTD

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TEST REPORT

Report Reference: 1200801111
Date Reported: 11 August 2020

Enitial Anderson Plates - PO:91403 - Site: Bry Lane Phase 2 MBT - Date Sampled: 06/08/2020

						*	*
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*
1200807566	07/08/20	UW001BIOAEM (93.)	---	140	---	812 cfu/m3	
1200807567	07/08/20	UW001BIOAEM (94.)	---	140	---		7 cfu/m3
1200807568	07/08/20	UW001BIOAEM (93.A)	---	140	---	952 cfu/m3	
1200807569	07/08/20	UW001BIOAEM (94.A)	---	140	---		< 7 cfu/m3
1200807570	07/08/20	UW001BIOAEM (93.B)	---	140	---	476 cfu/m3	
1200807571	07/08/20	UW001BIOAEM (94.B)	---	140	---		21 cfu/m3

Enitial Anderson Plates - PO:91403 - Site: Bry Lane Phase 2 MBT - Date Sampled: 06/08/2020

						*	*
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*
1200807572	07/08/20	DW002BIOAEM (93.)	---	140	---	210 cfu/m3	
1200807573	07/08/20	DW002BIOAEM (94.)	---	140	---		7 cfu/m3
1200807574	07/08/20	DW002BIOAEM (93.A)	---	140	---	147 cfu/m3	
1200807575	07/08/20	DW002BIOAEM (94.A)	---	140	---		133 cfu/m3
1200807576	07/08/20	DW002BIOAEM (93.B)	---	140	---	63 cfu/m3	
1200807577	07/08/20	DW002BIOAEM (94.B)	---	140	---		119 cfu/m3
1200807578	07/08/20	SR003BIOAEM (93.)	---	140	---	980 cfu/m3	
1200807579	07/08/20	SR003BIOAEM (94.)	---	140	---		294 cfu/m3
1200807580	07/08/20	SR003BIOAEM (93.A)	---	140	---	1120 cfu/m3	
1200807581	07/08/20	SR003BIOAEM (94.A)	---	140	---		301 cfu/m3
1200807582	07/08/20	SR003BIOAEM (93.B)	---	140	---	616 cfu/m3	
1200807583	07/08/20	SR003BIOAEM (94.B)	---	140	---		497 cfu/m3

Enitial Anderson Plates - PO:91403 - Site: Bry Lane Phase 2 MBT - Date Sampled: 06/08/2020

						*	*
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*

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.

Where there is a greater than 40% difference in bacterial duplicates, these are genuine results.

Carol Macready
Technical Administration Manager

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

SOUTHERN MICROBIOLOGICAL SERVICES LTD

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TEST REPORT

Report Reference: 1200801112
Date Reported: 11 August 2020

Enitial Anderson Plates Controls - PO:91403 - Site: Bry Lane Phase 2 MBT - Date Sampled: 06/08/2020

SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	*TVC/plate*	*Asp. Fumigatus Plate*
1200807590	07/08/20	_CONTROLBIOAEM (93-C)	---	---	---	15 cfu / plate	
1200807591	07/08/20	_CONTROLBIOAEM (94-C)	---	---	---		< 1 cfu / plate
1200807592	07/08/20	_FIELDLBIOAEM (93-F)	---	---	---	127 cfu / plate	
1200807593	07/08/20	_FIELDBIOAEM (94-F)	---	---	---		< 1 cfu / plate

Enitial Anderson Plates Controls - PO:91403 - Site: Bry Lane Phase 2 MBT -
Date Sampled: 06/08/2020

SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	*TVC/plate*	*Asp. Fumigatus Plate*

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.

Carol Macready
Technical Administration Manager